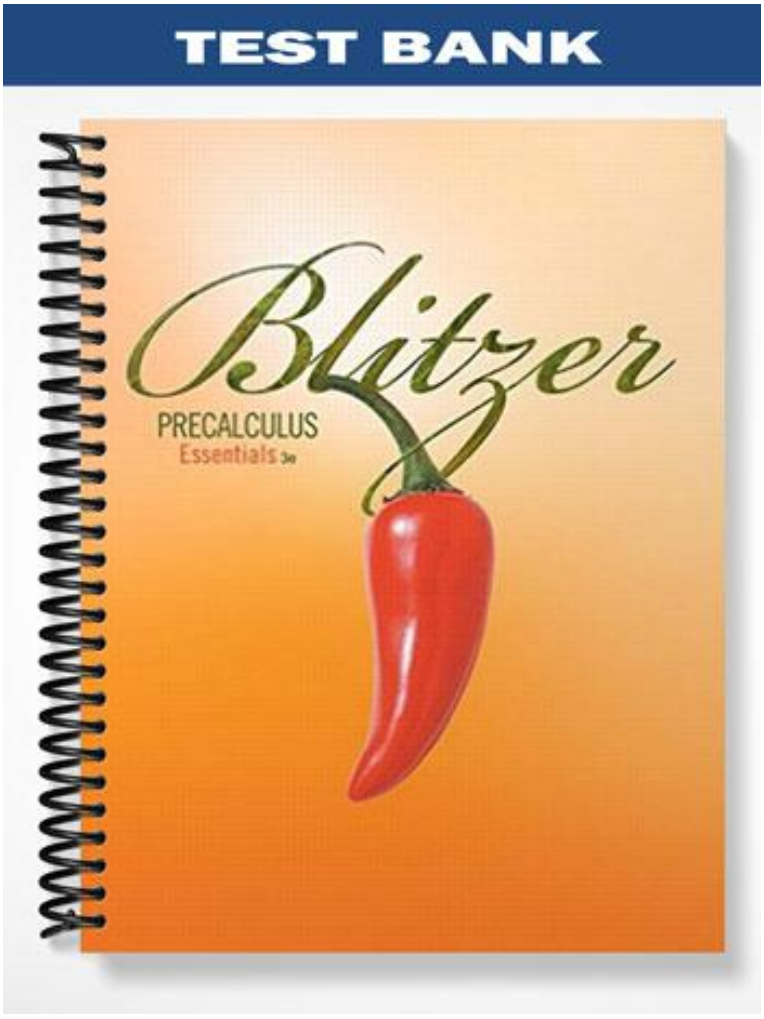
TEST BANK



Ch. 1 Functions and Graphs

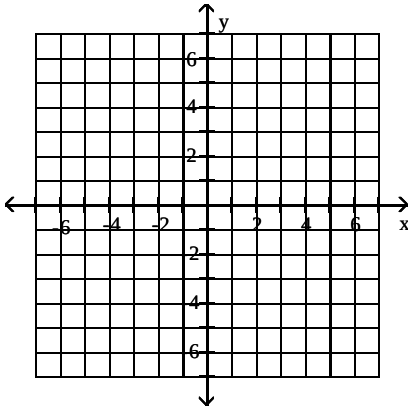
1.1 Graphs and Graphing Utilities

1 Plot Points in the Rectangular Coordinate System

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Plot the given point in a rectangular coordinate system.

1) (1, 3)



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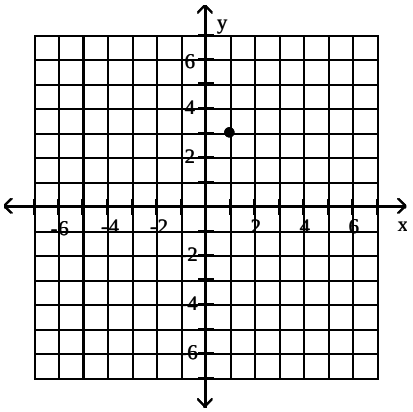

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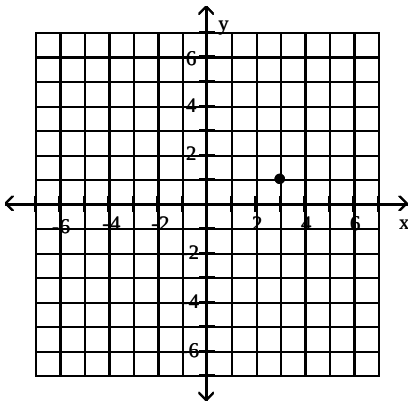

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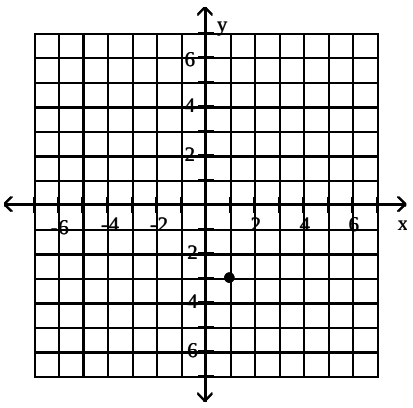

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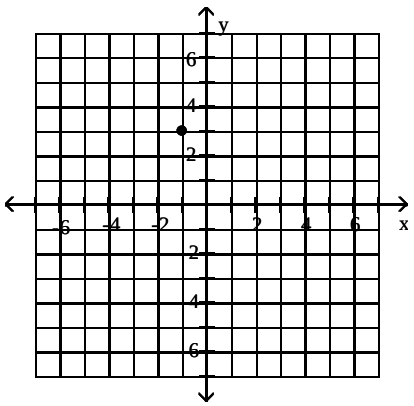

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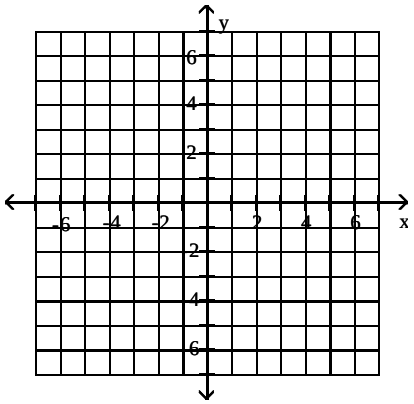
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x
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-6

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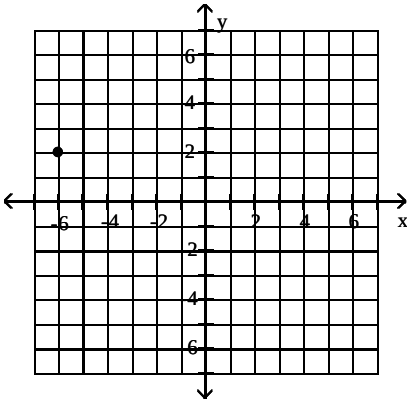
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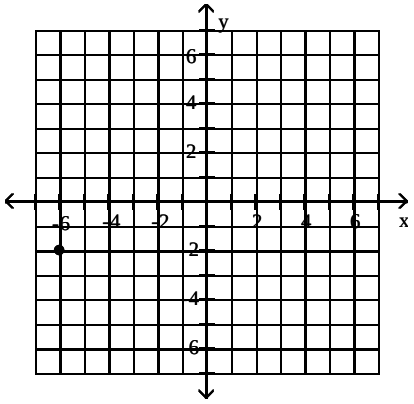
B)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x
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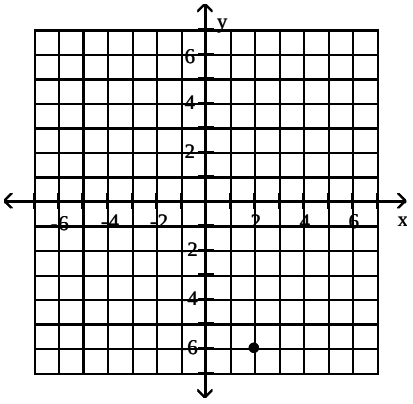
C)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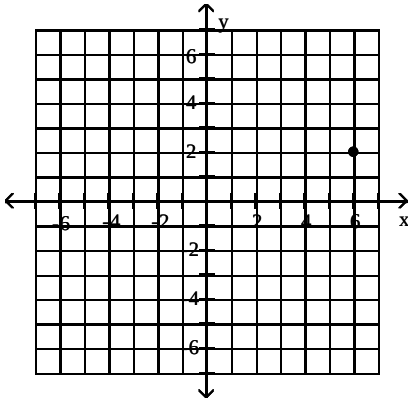
D)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-6
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-2
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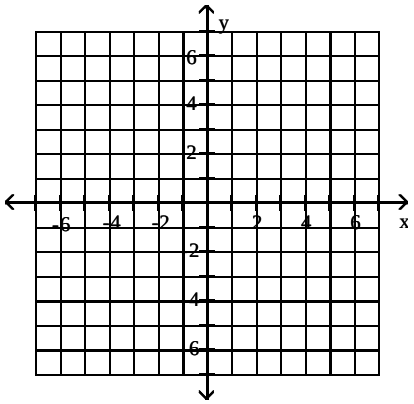
4
6
-2
-4
-6

3) (1, –5)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x
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-6
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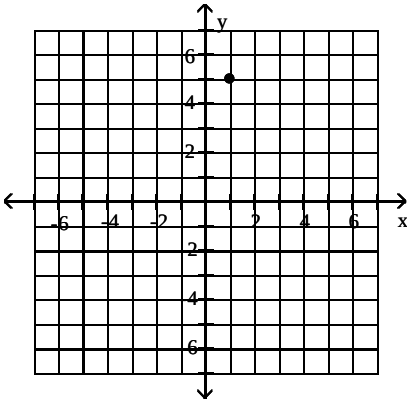
4
6
-2
-4
-6

A)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x
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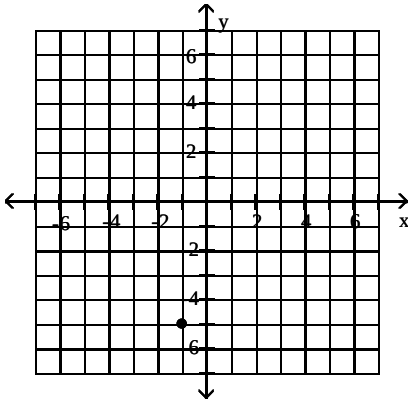
-6
-4
-2
2
4
6
-2
-4
-6

B)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x
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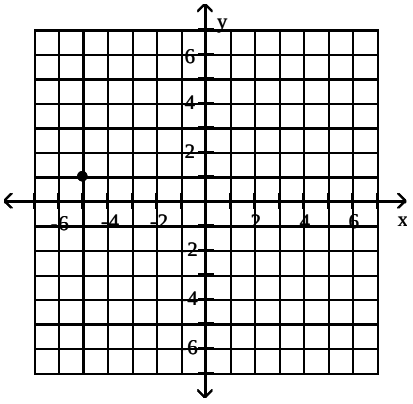
-2
2
4
6
-2
-4
-6

C)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x
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4
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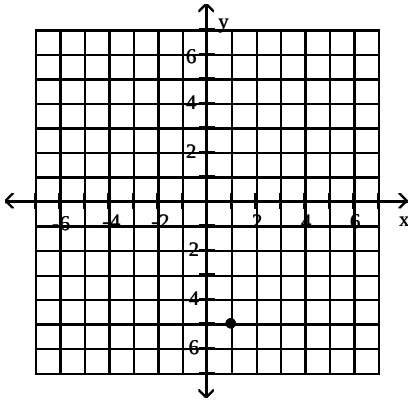
-6
-4
-2
2
4
6
-2
-4
-6

D)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x
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-6
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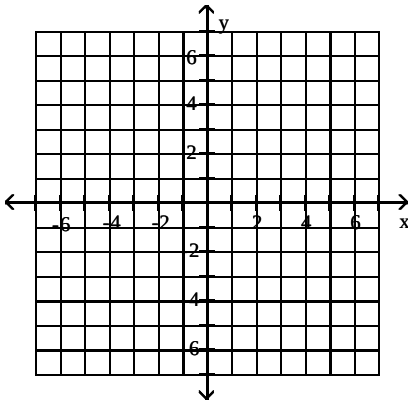
-2
2
4
6
-2
-4
-6

4) (–2, –4)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x
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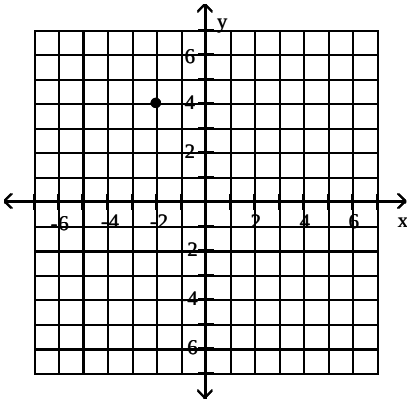
4
2
-6
-4
-2
2
4
6
-2
-4
-6

A)


y
x
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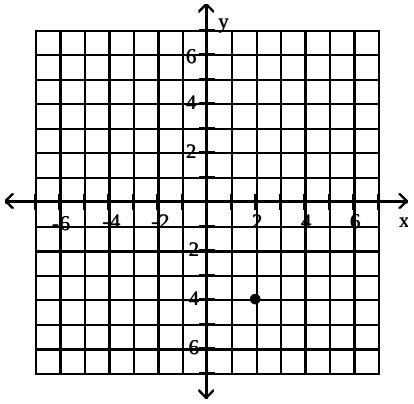
-6
-4
-2
2
4
6
-2
-4
-6

B)


y
x
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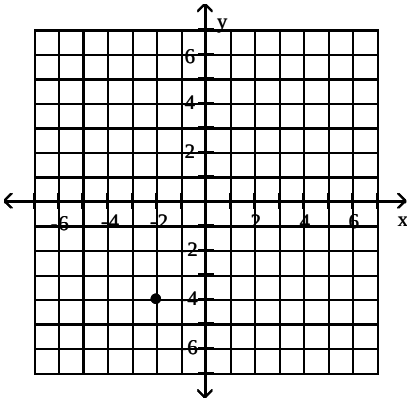
4
2
-6
-4
-2
2
4
6
-2
-4
-6

C)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x
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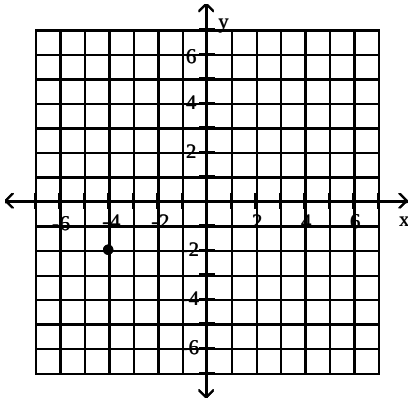
-6
-4
-2
2
4
6
-2
-4
-6

D)


y
x
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-6
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-2
2
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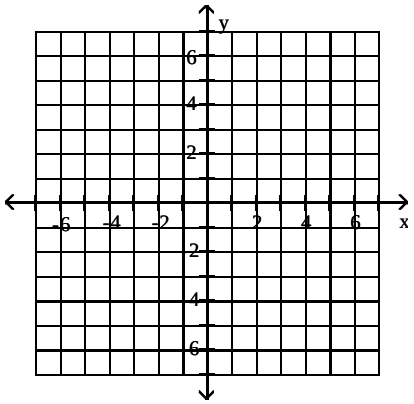
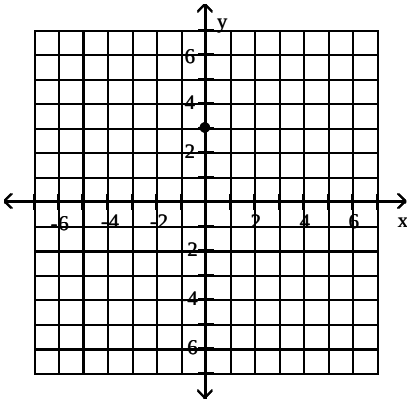
6
-2
-4
-6

5) (0, –3)


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

A)


y
x
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4
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-6
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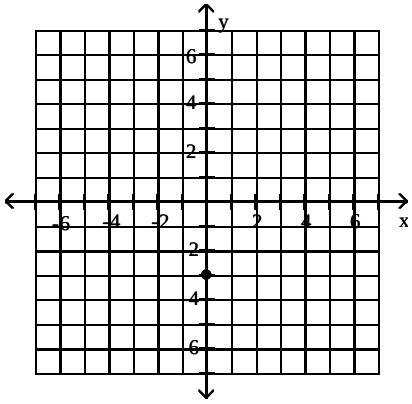
-2
2
4
6
-2
-4
-6

B)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x
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4
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-6
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2
4
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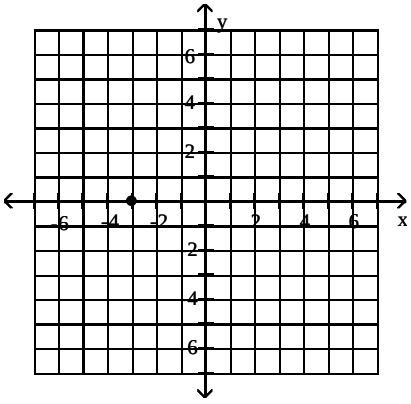
-2
-4
-6

C)


y
x
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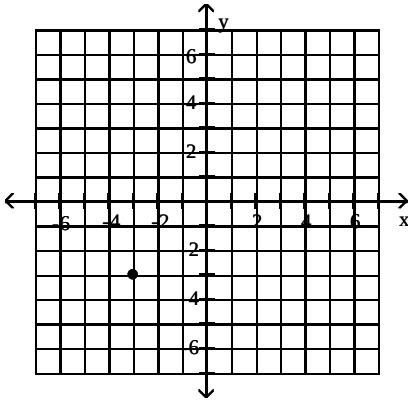
4
2
-6
-4
-2
2
4
6
-2
-4
-6

D)


y
x
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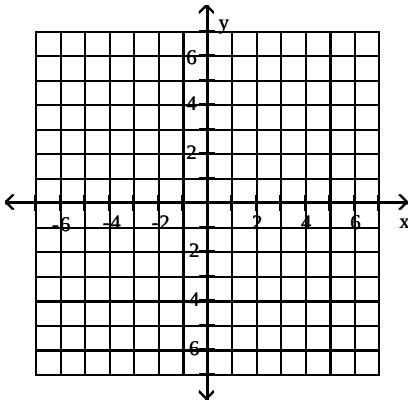
4
2
-6
-4
-2
2
4
6
-2
-4
-6

6) (–1, 0)


y
x
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4
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-6
-4
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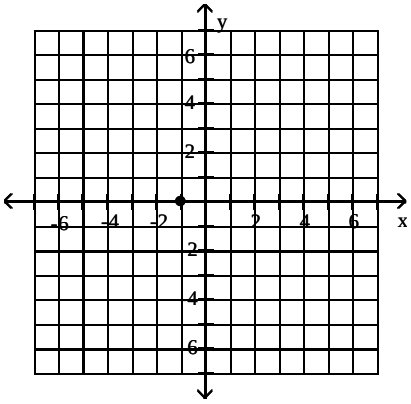
2
4
6
-2
-4
-6

A)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x
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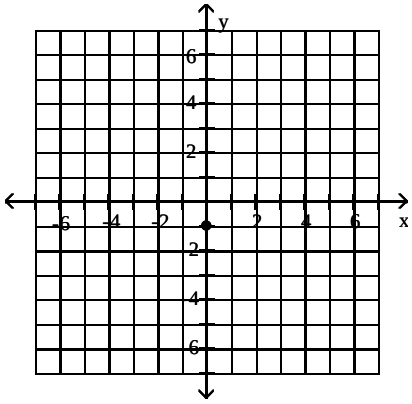
B)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x
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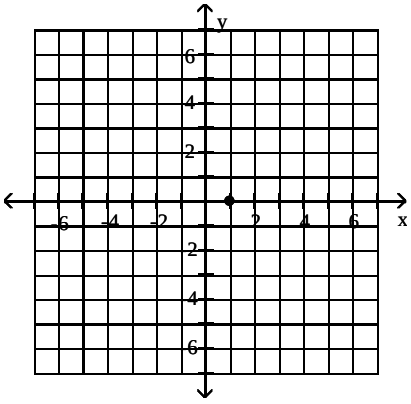
C)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x
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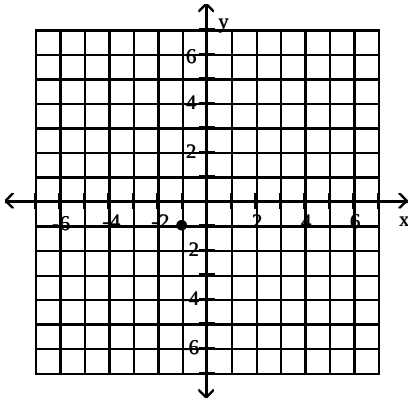
-4
-6

D)


y
x
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4
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-2
2
4
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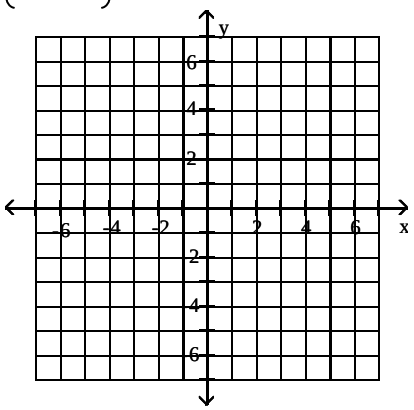
-2
-4
-6

7) $\left(-6, -\frac{9}{2}\right)$



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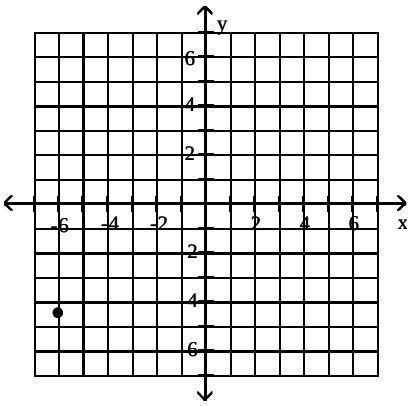

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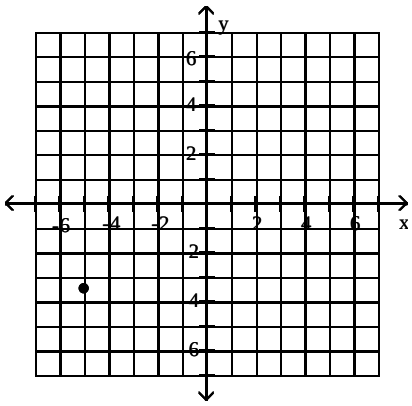

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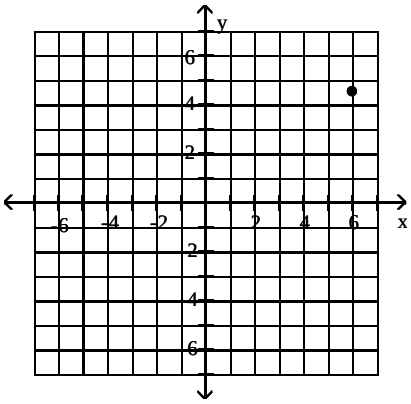

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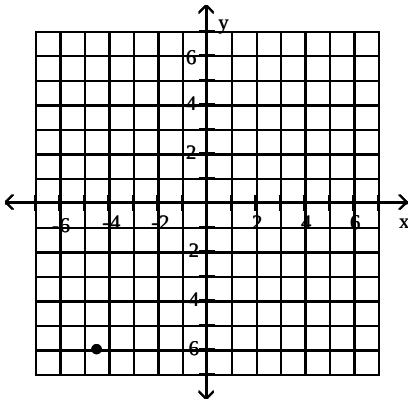
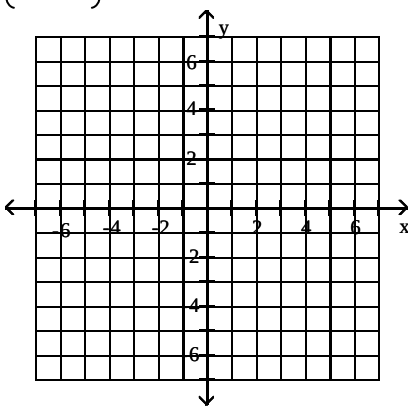


8) $\left(-\frac{11}{2}, 0\right)$



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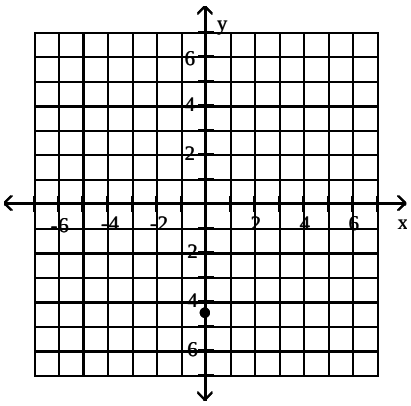

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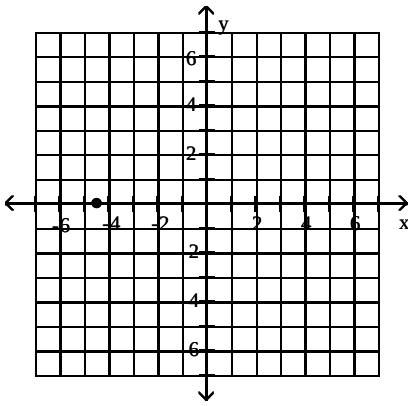

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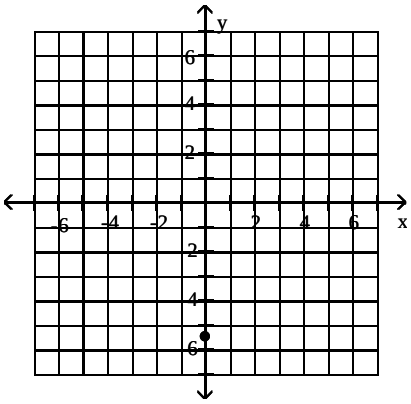
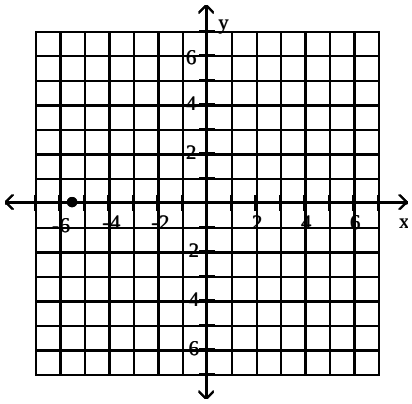


D)

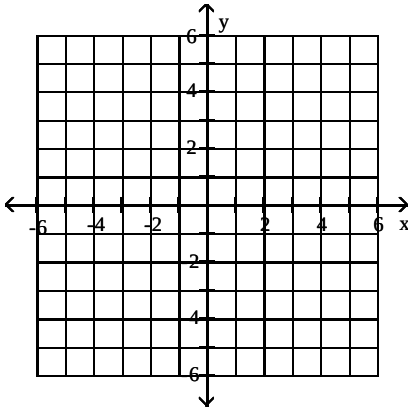


2 Graph Equations in the Rectangular Coordinate System

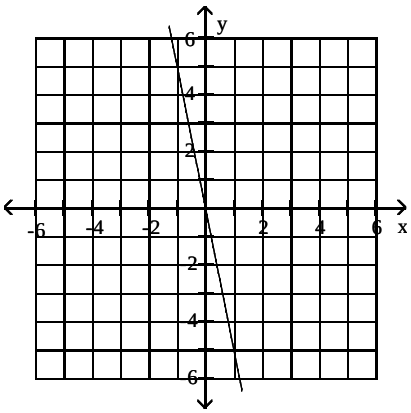
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph the equation.

1) $y = x - 5$



A)



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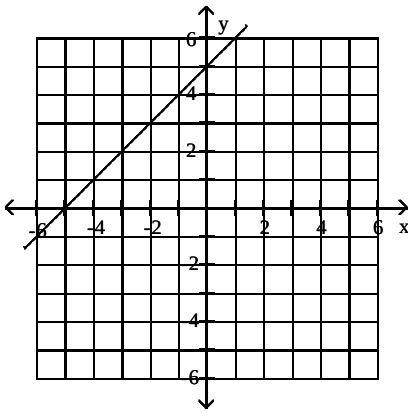
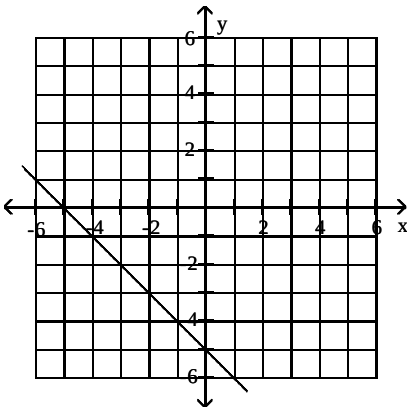
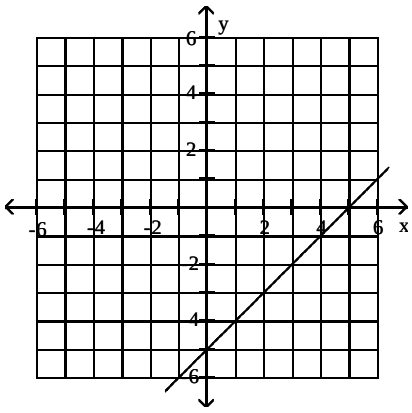


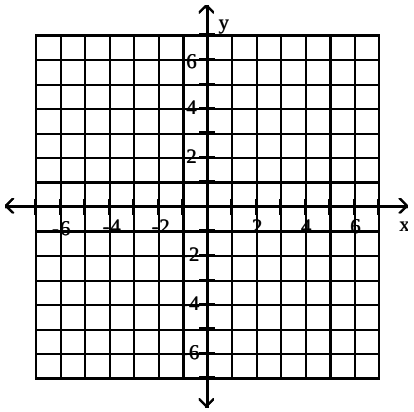
C)



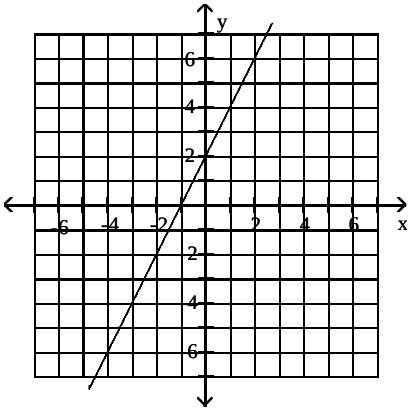
D)



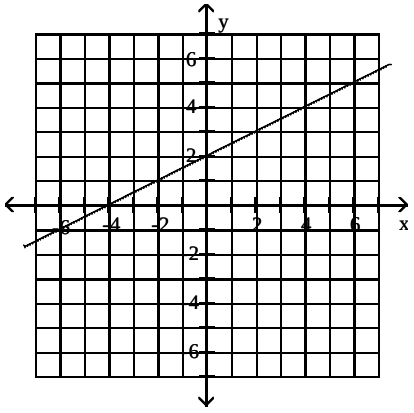
2) $y = 2x + 2$



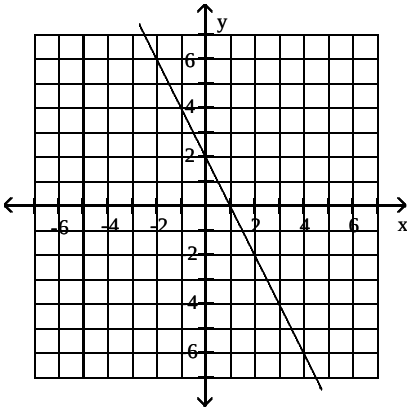
A)



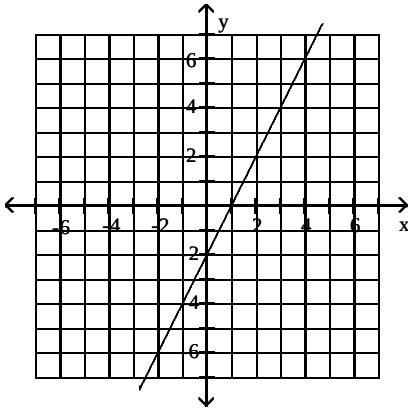
B)



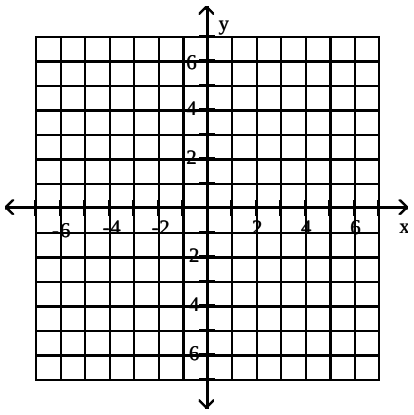
C)



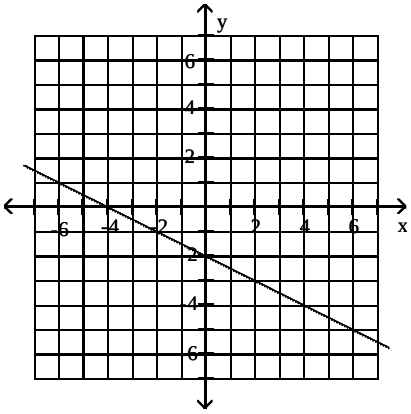
D)



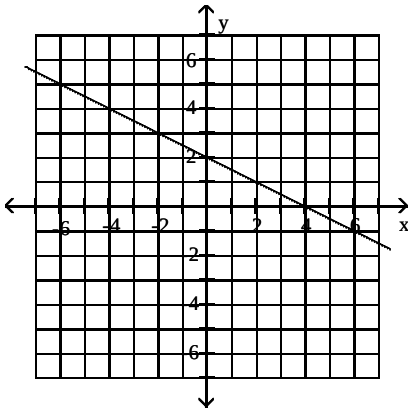
3) $y = -\frac{1}{2}x - 2$



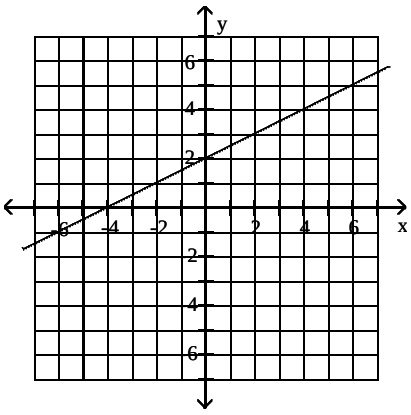
A)



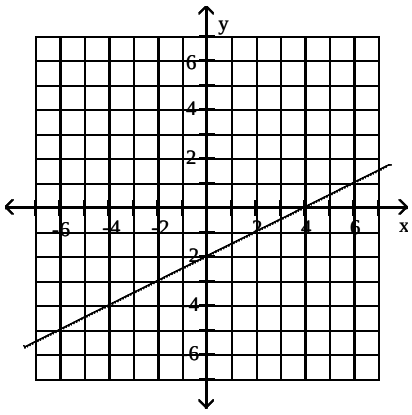
B)



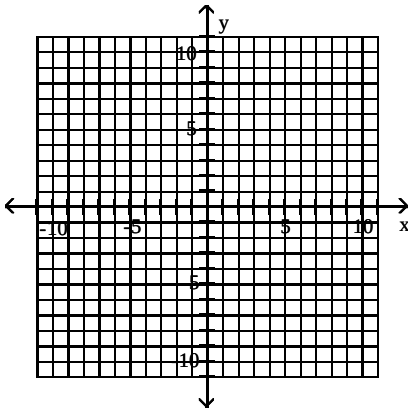
C)



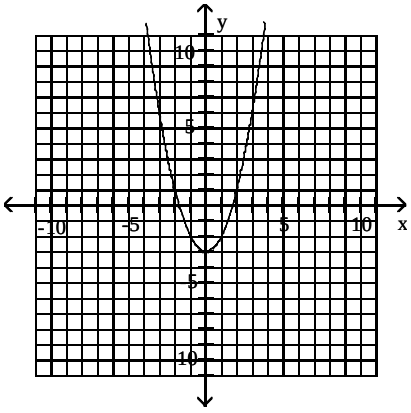
D)



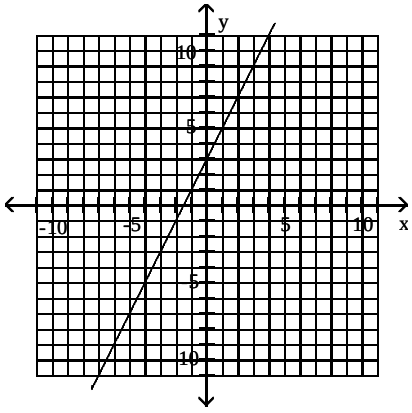
4) $y = x^2 + 3$


y
10
5
-10
-5
5
10
x
-5
-10

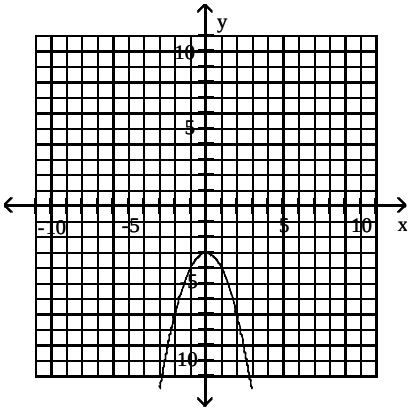
A)


y
10
5
-10
-5
5
10
x
-5
-10

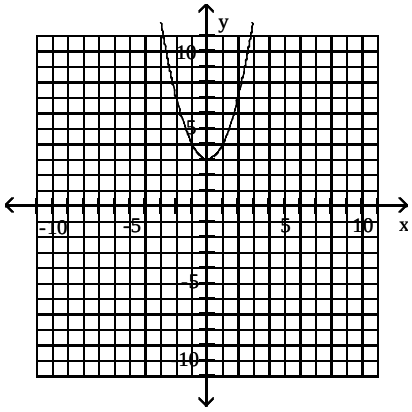
B)


y
10
5
-10
-5
5
10
x
-5
-10

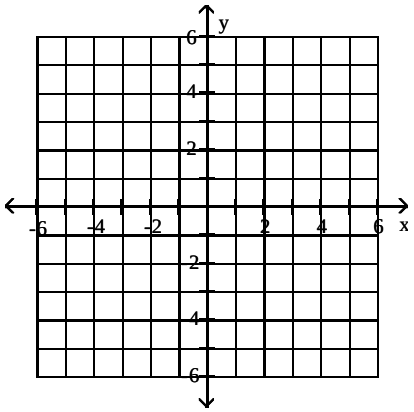
C)


y
10
5
-10
-5
5
10
x
-5
-10

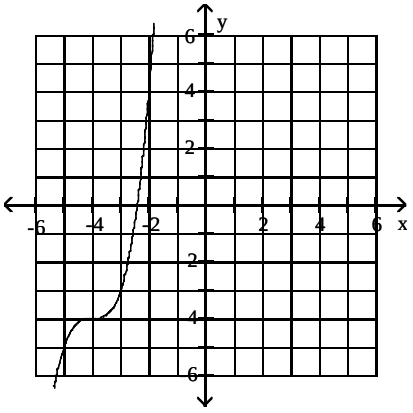
D)


y
10
5
-10
-5
5
10
x
-5
-10

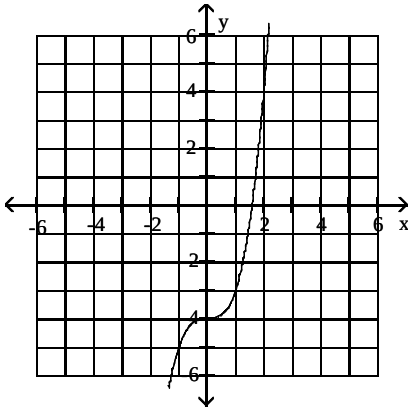
5) $y = x^3 - 4$


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

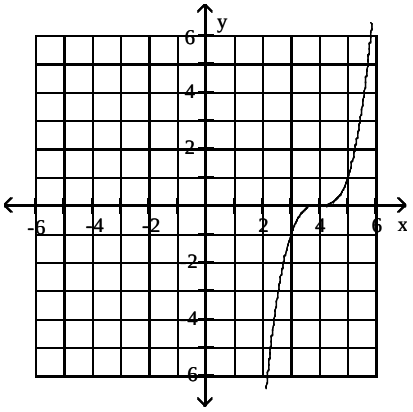
A)


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

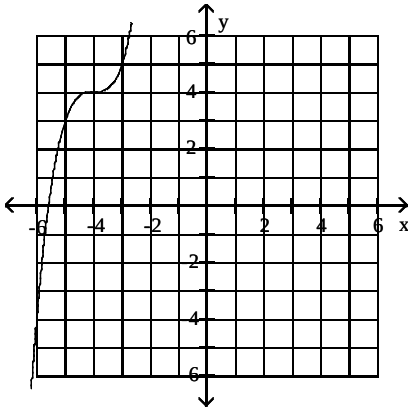
B)


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

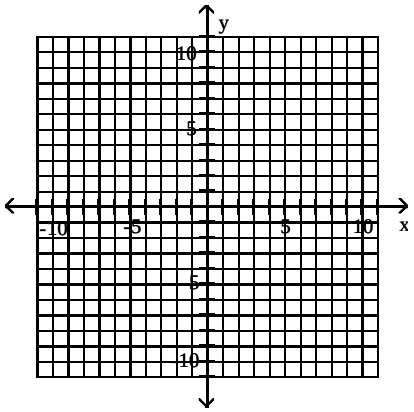
C)


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

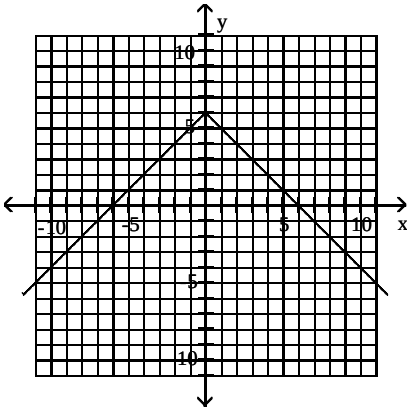
D)


y
x
6
4
2
-6
-4
-2
2
4
6
-2
-4
-6

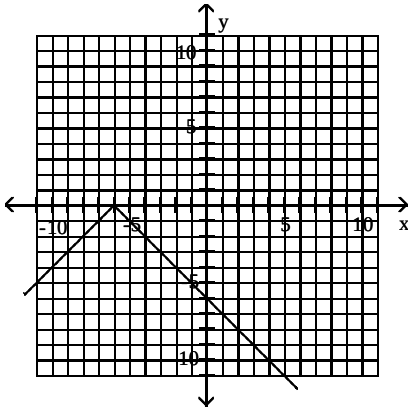
6) $y = -|x| + 6$



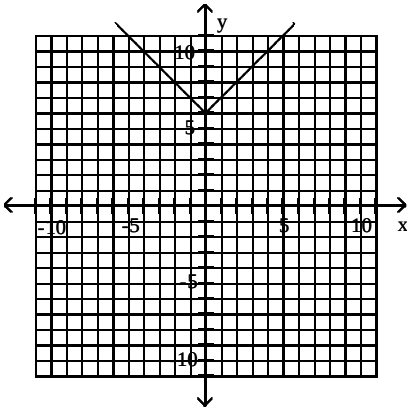
A)



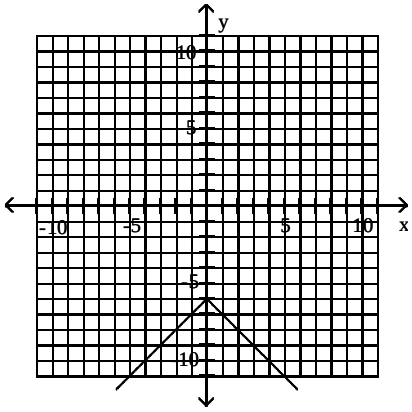
B)



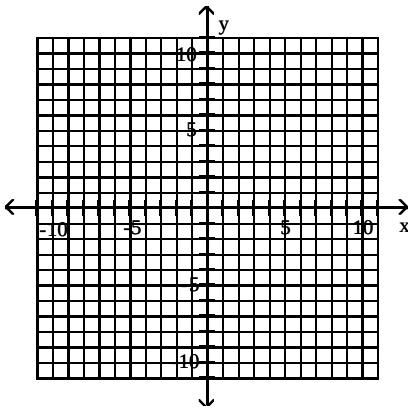
C)



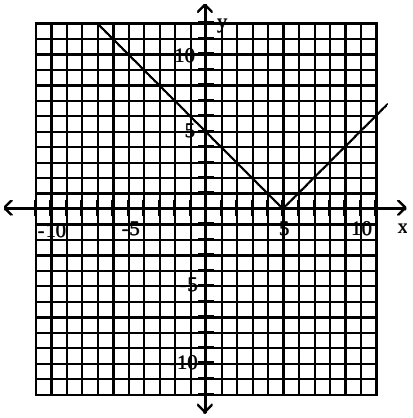
D)



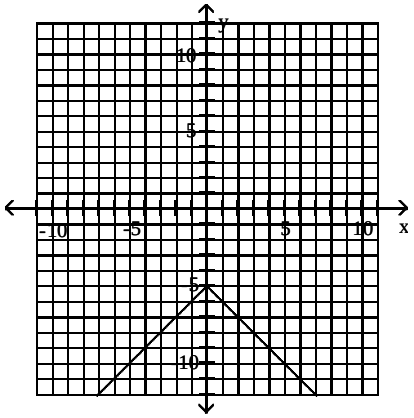
7) $y = -5|x|$



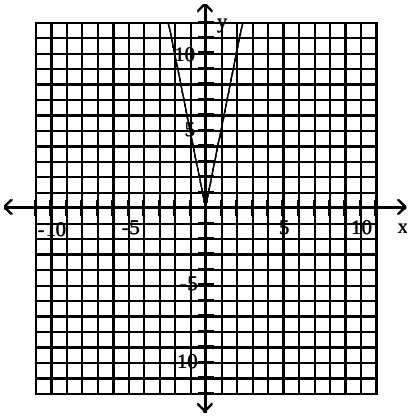
A)


y
10
5
-10
-5
5
10
x
5
10

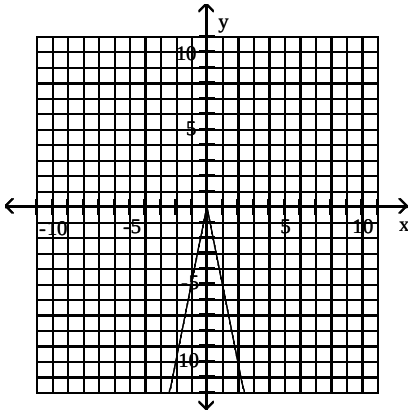
B)


y
10
5
-10
-5
5
10
x
5
10

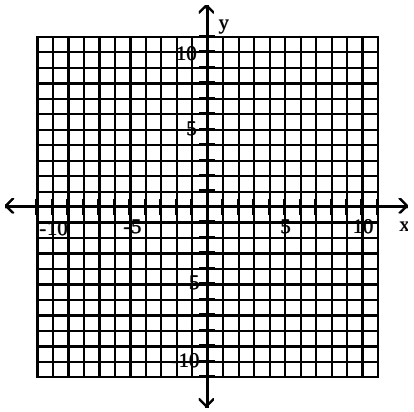
C)


y
10
5
-10
-5
5
10
x
5
10

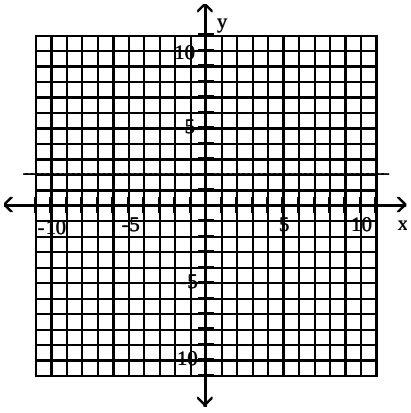
D)


y
10
5
-10
-5
5
10
x
5
10

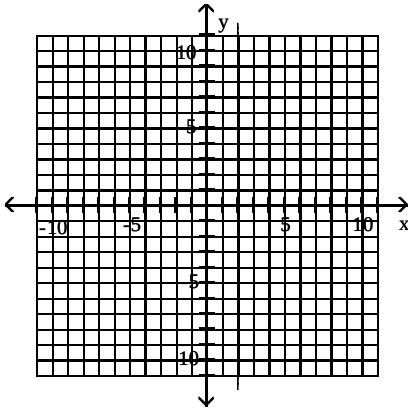
8) y = 2


y
10
5
-10
-5
5
10
x
-5
-10

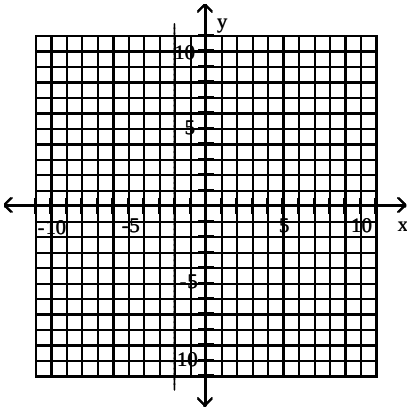
A)


y
10
5
-10
-5
5
10
x
-5
-10

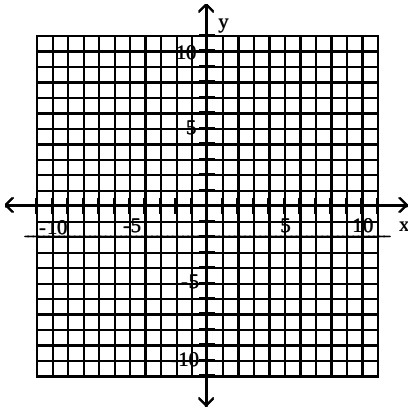
B)


y
10
5
-10
-5
5
10
x
-5
-10

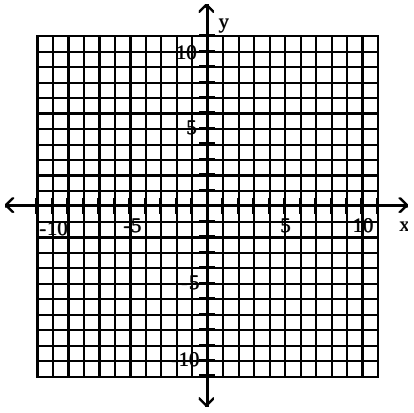
C)


y
10
5
-10
-5
5
10
x
-5
-10

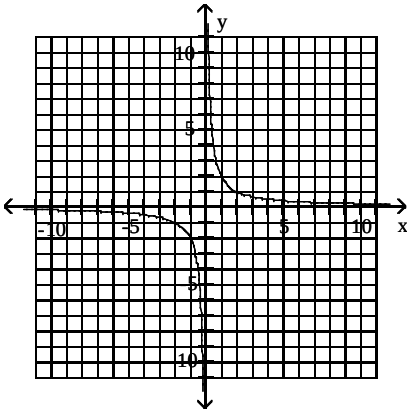
D)


y
10
5
-10
-5
5
10
x
-5
-10

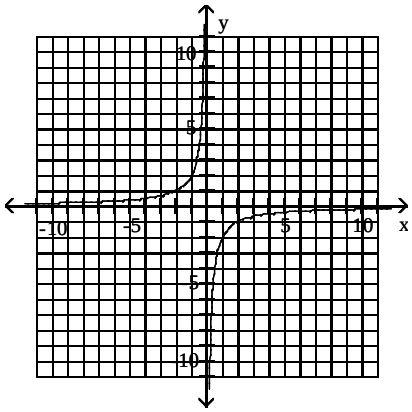
9) $y = \frac{1}{x}$



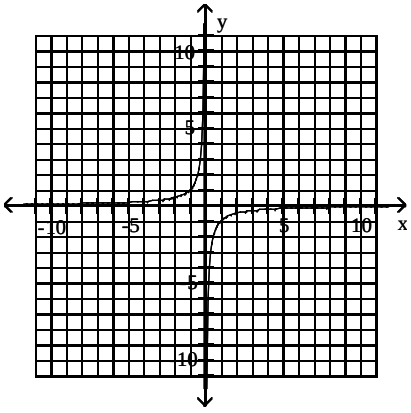
A)



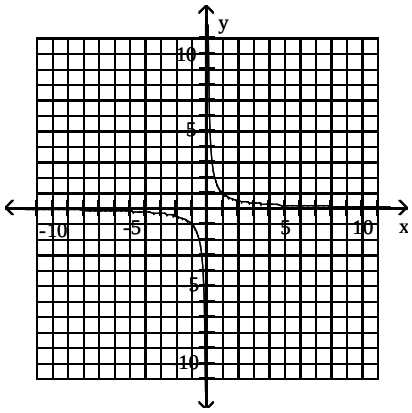
B)



C)

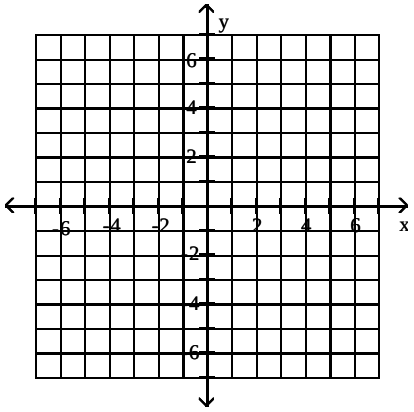


D)

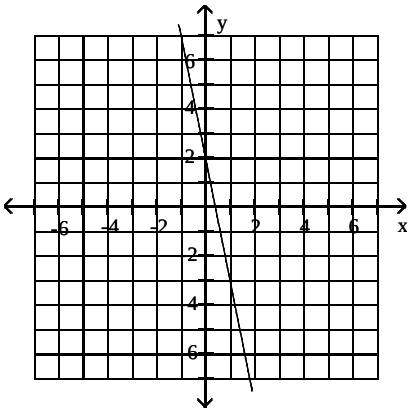


Write the English sentence as an equation in two variables. Then graph the equation.

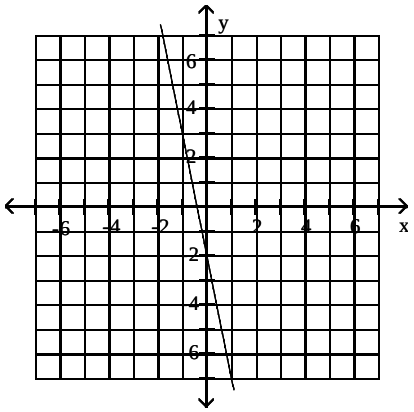
10) The y–value is two more than five times the x–value.



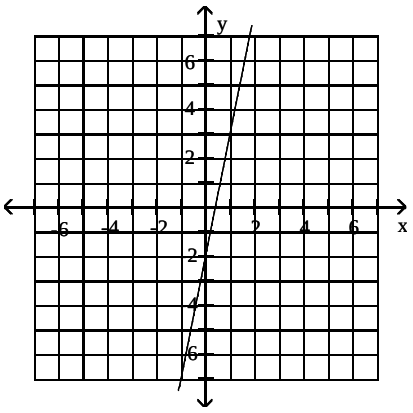
A) $y = -5x + 2$



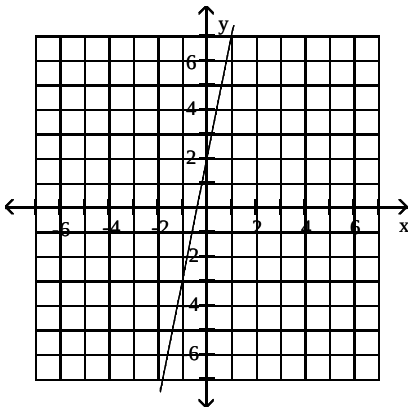
B) $y = -5x - 2$



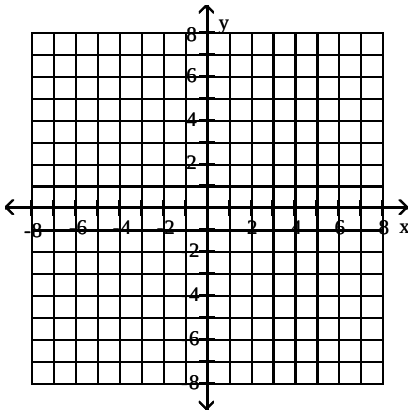
C) $y = 5x - 2$



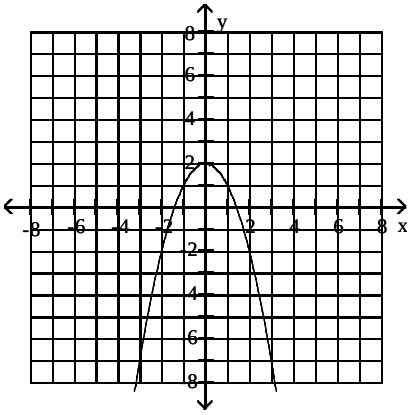
D) $y = 5x + 2$



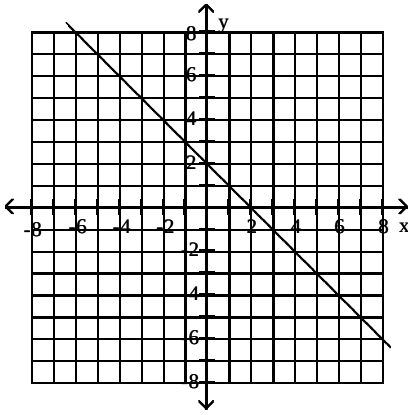
11) The y–value is two decreased by the square of the x–value.



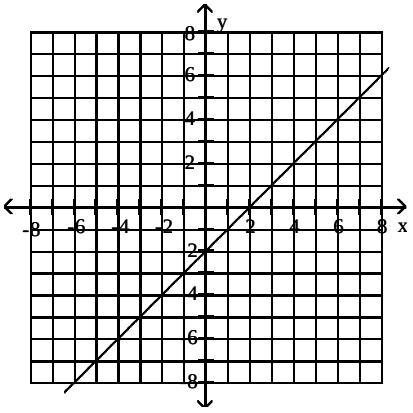
A) $y = 2 - x^2$



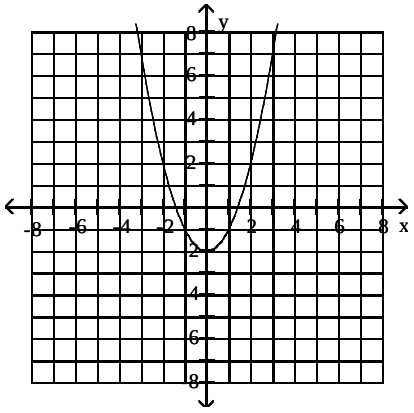
B) $y = 2 - x$



C) $y = x - 2$



D) $y = x^2 - 2$

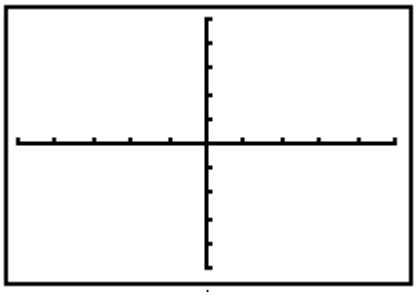


3 Interpret Information About a Graphing Utility's Viewing Rectangle or Table

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Match the correct viewing rectangle dimensions with the figure.

1)



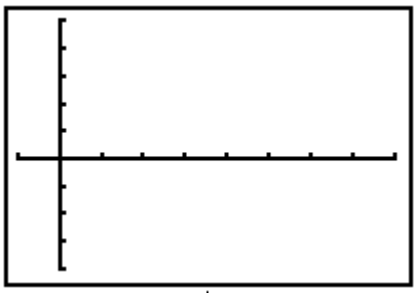
A) [–1, 1, 1] by [–1, 1, 1]

B) [–10, 5, 1] by [–10, 5, 1]

C) [–5, 5, 1] by [–5, 5, 1]

D) [–5, 5, 2] by [–5, 5, 2]

2)



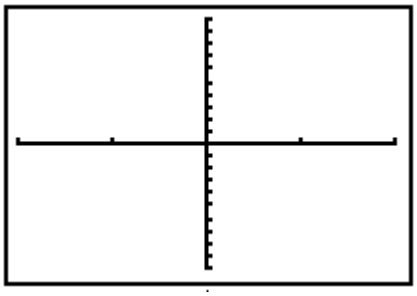
A) [–10, 5, 1] by [–10, 5, 1]

B) [–4, 5, 1] by [–1, 8, 1]

C) [–1, 8, 1] by [–4, 5, 1]

D) [–1, 8, 1] by [–1, 8, 1]

3)



A) [–2, 2, 1] by [–40, 40, 4]

B) [–2, 2, 1] by [–2, 2, 1]

C) [–10, 10, 1] by [–10, 10, 1]

D) [–8, 8, 2] by [–2, 2, 1]

4)

A) [–5, 40, 5] by [–5, 40, 5]

B) [–50, 150, 50] by [–2000, 2500, 500]

C) [–5, 25, 5] by [–20, 40, 5]

D) [–50, 25, 5] by [–50, 25, 5]

The table of values was generated by a graphing utility with a TABLE feature. Use the following table to solve.

X	Y_1	Y_2
-3	9	-3
-2	4	-1
-1	1	1
0	0	3
1	1	5
2	4	7
3	9	9

5) Which equation corresponds to Y_2 in the table?

A) $y_2 = 2 - 3x$

B) $y_2 = x + 2$

C) $y_2 = 2x - 3$

D) $y_2 = 2x + 3$

6) Does the graph of Y_2 pass through the origin?

A) Yes

B) No

7) At which points do the graph of Y_1 and Y_2 intersect?

A) (–1, 1) and (1, 5)

B) (1, 3) and (3, 9)

C) (1, 5) and (1, 3)

D) (–1, 1) and (3, 9)

8) For which values of x is $Y_1 = Y_2$?

A) 2 and 0

B) –1 and 2

C) 2 and 3

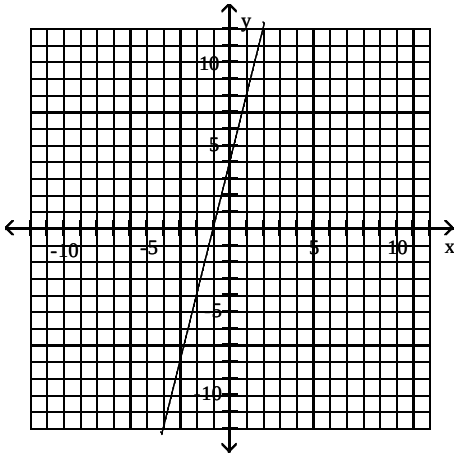
D) –1 and 3

4 Use a Graph to Determine Intercepts

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the graph to determine the x– and y–intercepts.

1)



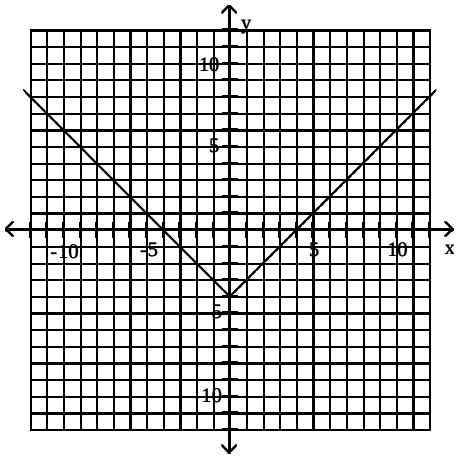
A) x–intercept: –1; y–intercept: –4

B) x–intercept: –1; y–intercept: 4

C) x–intercept: –4; y–intercept: 4

D) x–intercept: 1; y–intercept: 4

2)



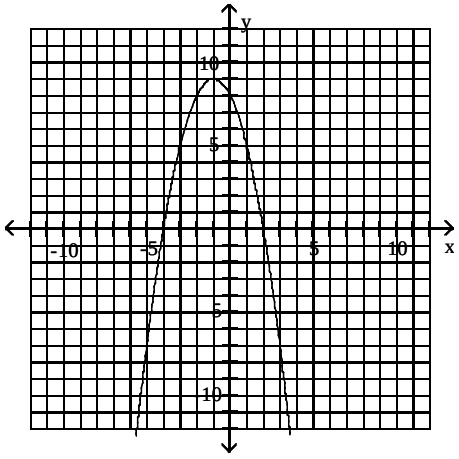
A) x–intercepts: –4, 4

B) x–intercepts: –4, 4; y–intercept: 0

C) y–intercept: –4

D) x–intercepts: –4, 4; y–intercept: –4

3)



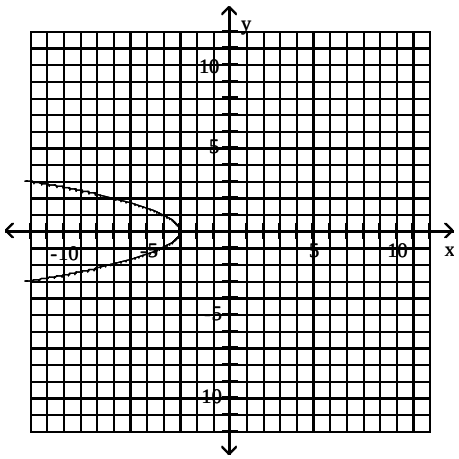
A) x–intercept: 2; y–intercept: 8

B) x–intercept: 8; y–intercepts: –4, 2

C) x–intercepts: –4, 2; y–intercept: 8

D) x–intercept: –4; y–intercepts: 2, 8

4)



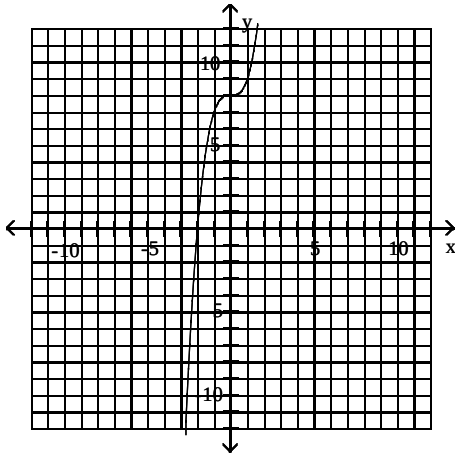
A) x–intercept: 3

B) y–intercept: –3

C) y–intercept: 3

D) x–intercept: –3

5)



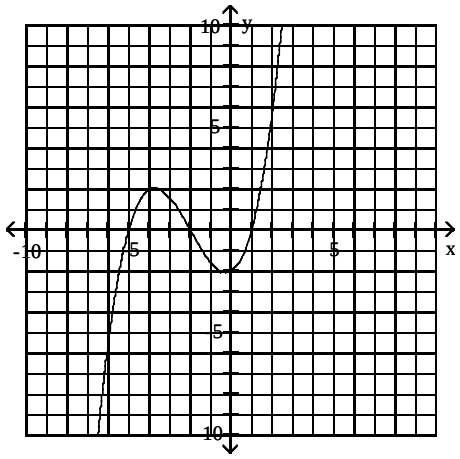
A) x–intercept: 2; y–intercept: 8

B) x–intercept: –2; y–intercept: 8

C) x–intercept: –2; y–intercept: –8

D) x–intercept: 2; y–intercept: –8

6)



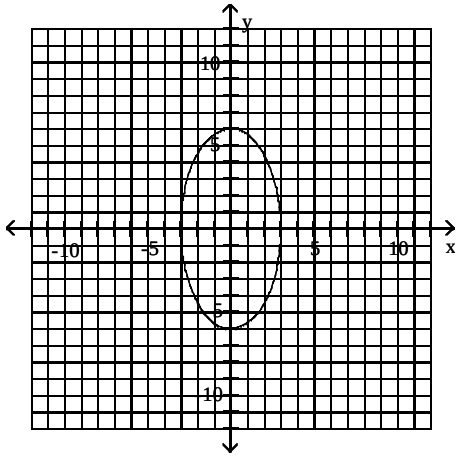
A) x–intercept: –2; y–intercepts: –2, 1, –5

B) x–intercept: –2; y–intercepts: 2, 1, 5

C) x–intercepts: 2, 1, 5; y–intercept: –2

D) x–intercepts: –2, 1, –5; y–intercept: –2

7)



A) y–intercepts: –6, 6

B) x–intercepts: –3, 3; y–intercepts: –6, 6

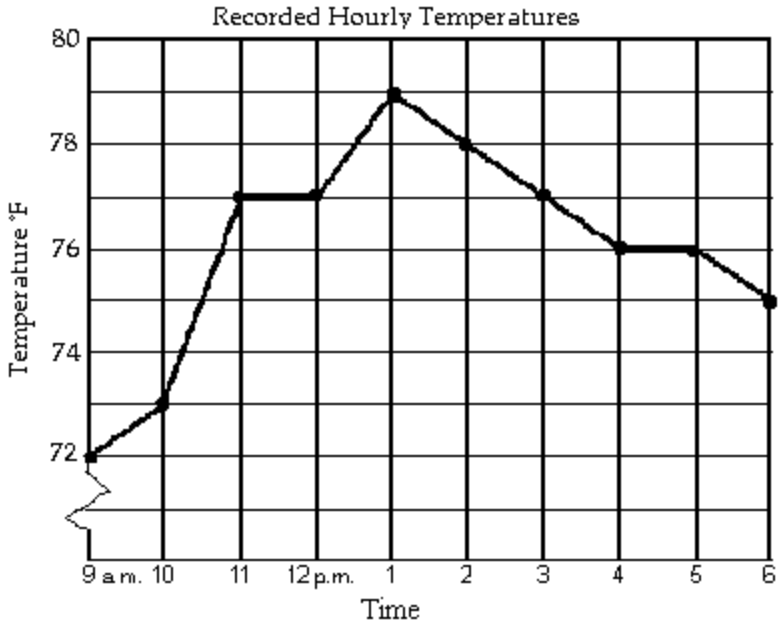
C) x–intercepts: –6, 6; y–intercepts: –3, 3

D) x–intercepts: –3, 3

5 Interpret Information Given by Graphs

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The line graph shows the recorded hourly temperatures in degrees Fahrenheit at an airport.



1) At what time was the temperature the highest?

A) 11 a.m.

B) 5 p.m.

C) 2 p.m.

D) 1 p.m.

2) At what time was the temperature its lowest?

A) 4 p.m.

B) 6 p.m.

C) 9 a.m.

D) 1 p.m.

3) What temperature was recorded at 10 a.m.?

A) 73 ° F

B) 74 ° F

C) 71 ° F

D) 75 ° F

4) During which hour did the temperature increase the most?

A) 12 p.m. to 1 p.m. B) 1 p.m. to 2 p.m. C) 9 a.m. to 10 a.m. D) 10 a.m. to 11 a.m.

5) At what time was the temperature 77°?

A) 11 a.m. and 12 p.m. and 3 p.m. B) 11 a.m. and 12 p.m.

C) 12 p.m. and 3 p.m. D) 2 p.m.

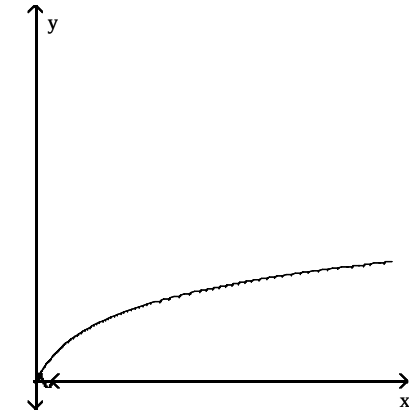
6) During which two hour period did the temperature increase the most?

A) 12 p.m. to 2 p.m. B) 10 a.m. to 12 p.m. C) 10 a.m. to 11 a.m. D) 9 a.m. to 11 a.m.

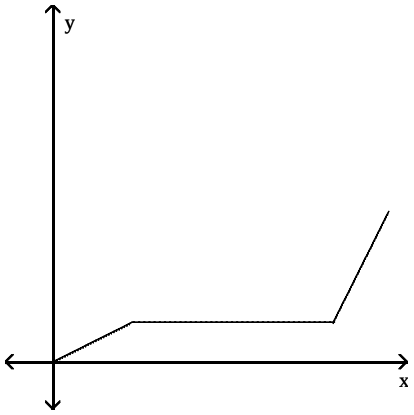
Match the story with the correct figure.

7) The amount of rainfall as a function of time, if the rain fell more and more softly.

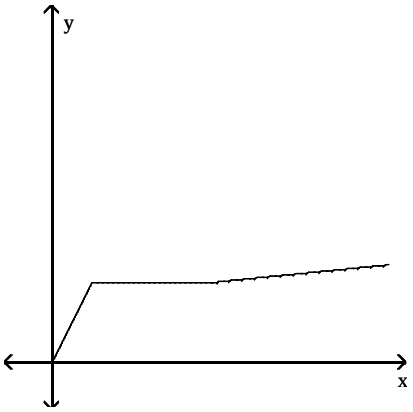
A)



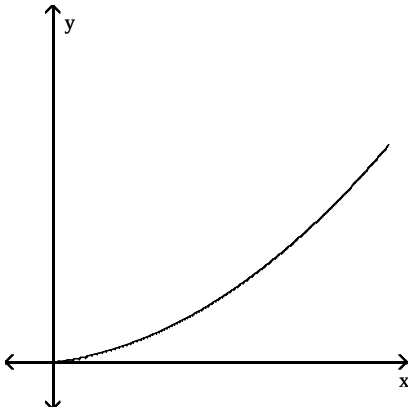
B)



C)

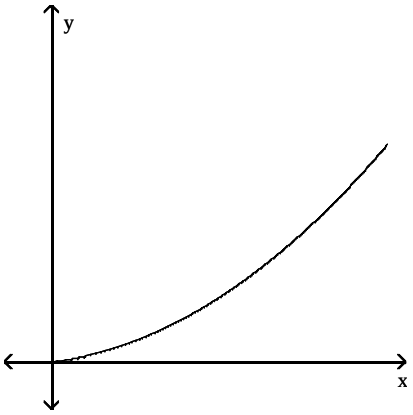


D)

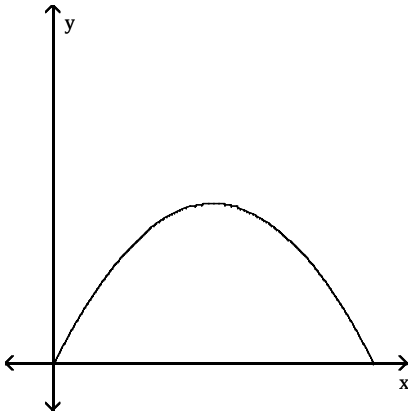


8) The height of an animal as a function of time.

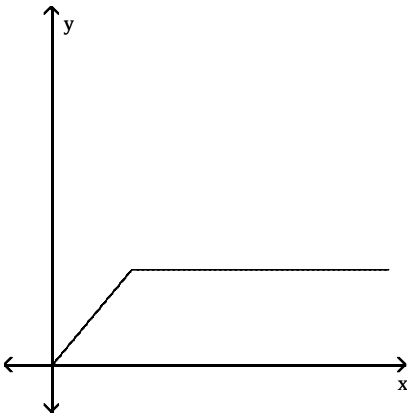
A)



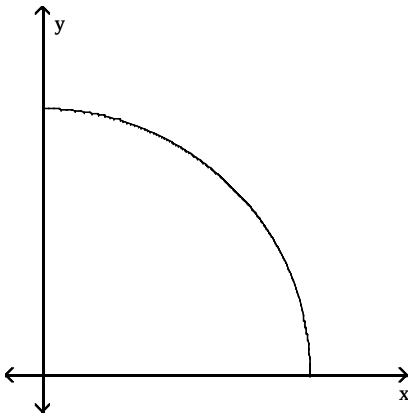
B)



C)

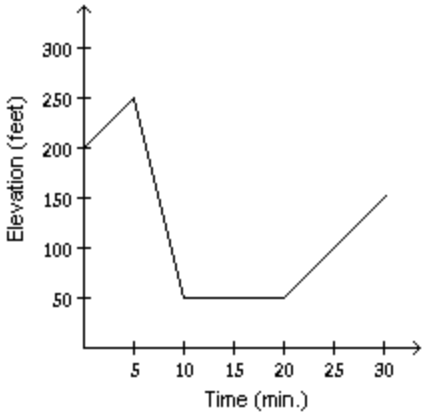


D)

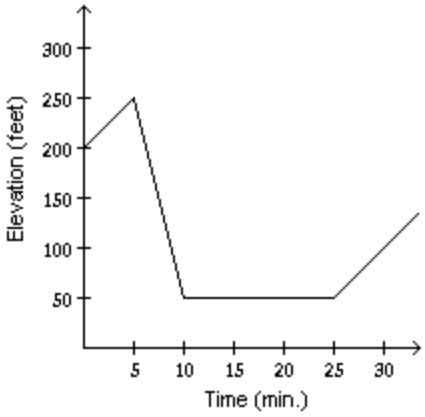


9) Mark started out by walking up a hill for 5 minutes. For the next 5 minutes he walked down a steep hill to an elevation lower than his starting point. For the next 10 minutes he walked on level ground. For the next 10 minutes he walked uphill. Determine which graph of elevation above sea level versus time illustrates the story.

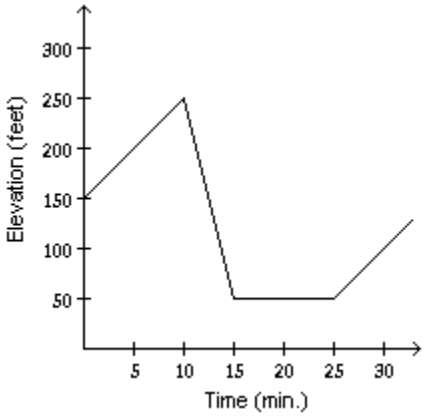
A)



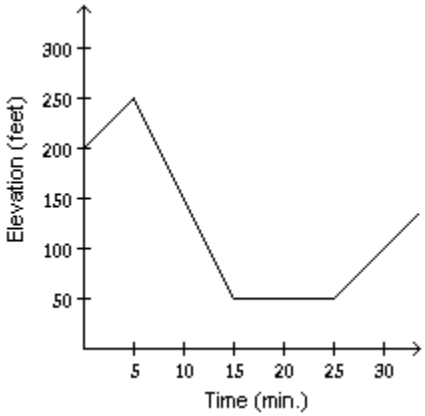
B)



C)



D)



1.2 Basics of Functions and Their Graphs

1 Find the Domain and Range of a Relation

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Give the domain and range of the relation.

1) {(–7, 4), (5, 3), (2, –3), (2, –2)}

A) domain = {5, 2, –7, –2}; range = {3, –3, 4, –2}

B) domain = {5, 2, –7, 12}; range = {3, –3, 4, –2}

C) domain = {3, –3, 4, –2}; range = {5, 2, –7}

D) domain = {5, 2, –7}; range = {3, –3, 4, –2}

2) {(8, –6), (–3, 2), (2, 1), (2, –1)}

A) domain = {–3, 2, 8}; range = {2, 1, –6, –1}

B) domain = {2, 1, –6, –1}; range = {–3, 2, 8}

C) domain = {–3, 2, 8, –2}; range = {2, 1, –6, –1}

D) domain = {–3, 2, 8, 12}; range = {2, 1, –6, –1}

3) {(1, 3), (2, 5), (4, 2), (10, –9)}

A) domain = {4, 10, 1, 2}; range = {2, –3, –9, 3, 5}

B) domain = {4, 10, 1, 2}; range = {2, 2, –9, 3, 5}

C) domain = {2, –9, 3, 5}; range = {4, 10, 1, 2}

D) domain = {4, 10, 1, 2}; range = {2, –9, 3, 5}

4) {(9, 4), (9, –1), (–5, –7), (1, 8), (5, 6)}

A) domain = {1, –5, 5, 9}; range = {8, –7, 6, –1, 4}

B) domain = {1, –4, –5, 5, 9}; range = {8, –7, 6, –1, 4}

C) domain = {8, –7, 6, –1, 4}; range = {1, 1, –5, 5, 9}

D) domain = {1, 14, –5, 5, 9}; range = {8, –7, 6, –1, 4}

5) {(11, –2), (–5, –1), (–5, 0), (–4, 1), (4, 3)}

A) domain: {11, –4, –5, 4}; range: {–2, –1, 1, 3}

B) domain: {–2, –1, 1, 3}; range: {11, –4, –5, 4}

C) domain: {–2, –1, 0, 1, 3}; range: {11, –4, –5, 4}

D) domain: {11, –4, –5, 4}; range: {–2, –1, 0, 1, 3}

6) {(–1, –3), (–2, –4), (–11, –8), (–6, 5), (8, –9)}

A) domain = {–3, –9, –4, 5, –8}; range = {–1, 8, –2, –6, –11}

B) domain = {–4, –6, 5, –11, –8}; range = {–1, –3, 8, –9, –2}

C) domain = {–1, 8, –2, –6, –11}; range = {–3, –9, –4, 5, –8}

D) domain = {–1, –3, 8, –9, –2}; range = {–4, –6, 5, –11, –8}

7) {(–4, 17), (–3, 10), (0, 1), (3, 10), (5, 26)}

A) domain: {17, 10, 1, 26}; range: {–4, –3, 3, 5}

B) domain: {–4, –3, 0, 3, 5}; range: {17, 10, 1, 26}

C) domain: {–4, –3, 3, 5}; range: {17, 10, 1, 26}

D) domain: {17, 10, 1, 26}; range: {–4, –3, 0, 3, 5}

2 Determine Whether a Relation is a Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the relation is a function.

1) {(–2, 7), (1, 1), (4, –8), (8, –4), (10, –3)}

A) Not a function

B) Function

2) {(–3, 4), (–2, –8), (2, –5), (2, 5)}

A) Function

B) Not a function

3) {(–7, –9), (–7, –2), (1, 9), (3, –1), (10, –2)}

A) Not a function

B) Function

4) {(2, –1), (2, –7), (4, –4), (9, 9), (12, 3)}

A) Not a function

B) Function

5) {(–5, 3), (–2, –6), (4, 1), (6, 7)}

A) Not a function

B) Function

6) {(–7, 4), (–7, –2), (1, 2), (6, –7), (8, 5)}

A) Function

B) Not a function

7) {(–8, 4), (–4, 3), (–2, –8), (4, –9)}

A) Function B) Not a function

8) {(–6, –8), (–3, 5), (1, –8), (1, 7)}

A) Not a function B) Function

9) {(–6, –8), (–3, 4), (3, –9), (6, 8)}

A) Not a function B) Function

10) {(–1, 7), (2, –1), (6, 6), (7, 3), (10, 8)}

A) Not a function B) Function

3 Determine Whether an Equation Represents a Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the equation defines y as a function of x.

1) $x + y = 81$

A) y is a function of x B) y is not a function of x

2) $5x + 5y = 13$

A) y is a function of x B) y is not a function of x

3) $x^2 + y = 64$

A) y is a function of x B) y is not a function of x

4) $x + y^2 = 81$

A) y is a function of x B) y is not a function of x

5) $x^2 + y^2 = 25$

A) y is a function of x B) y is not a function of x

6) $y^2 = 2x$

A) y is a function of x B) y is not a function of x

7) $x = y^2$

A) y is a function of x B) y is not a function of x

8) $y = x^2$

A) y is a function of x B) y is not a function of x

9) $y = -\sqrt{x + 6}$

A) y is a function of x B) y is not a function of x

10) $y = \sqrt{-8x - 6}$

A) y is a function of x

B) y is not a function of x

11) $x + y^3 = 27$

A) y is a function of x

B) y is not a function of x

12) $xy + 3y = 1$

A) y is a function of x

B) y is not a function of x

13) $|x| - y = 5$

A) y is a function of x

B) y is not a function of x

4 Evaluate a Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate the function at the given value of the independent variable and simplify.

1) $f(x) = -2x - 9$; $f(-3)$

A) 15 B) −3 C) −11 D) 33

2) $f(x) = x^2 - 2$; $f(x - 3)$

A) $x^2 - 5$ B) $x^2 + 9$ C) $x^2 - 6x + 7$ D) $x^2 - 6x + 9$

3) $f(x) = 3x^2 + 3x + 7$; $f(x - 1)$

A) $3x^2 - 3x + 13$ B) $3x^2 + 24x + 13$ C) $-3x^2 + 3x + 7$ D) $3x^2 - 3x + 7$

4) $g(x) = 5x - 3$; $g(x + 1)$

A) $5x - 1$ B) $5x + 2$ C) $5x - 3$ D) $\frac{1}{5}x - 3$

5) $h(x) = |x - 4|$; $h(5)$

A) 1 B) −1 C) 9 D) −9

6) $f(x) = \sqrt{x + 20}$; $f(-4)$

A) 2 B) 4 C) −4 D) not a real number

7) $f(x) = \frac{x^2 - 7}{x^3 - 2x}$; $f(-4)$

A) $-\frac{2}{7}$ B) $-\frac{3}{22}$ C) $-\frac{9}{56}$ D) $-\frac{9}{64}$

8) $f(x) = \frac{x^3 - 4}{x^2 + 8}$; $f(-3)$

A) $-\frac{27}{17}$ B) $-\frac{31}{9}$ C) $\frac{5}{17}$ D) $-\frac{31}{17}$

Solve the problem.

9) The function $P(x) = 0.40000001x - 73$ models the relationship between the number of pretzels x that a certain vendor sells and the profit the vendor makes. Find $P(700)$, the profit the vendor makes from selling 700 pretzels.

A) \$353 B) \$627 C) \$207 D) \$280

10) The total cost in dollars for a certain company to produce x empty jars to be used by a jelly producer is given by the function $C(x) = 0.7x + 12{,}000$. Find $C(80{,}000)$, the cost of producing 80,000 jars.

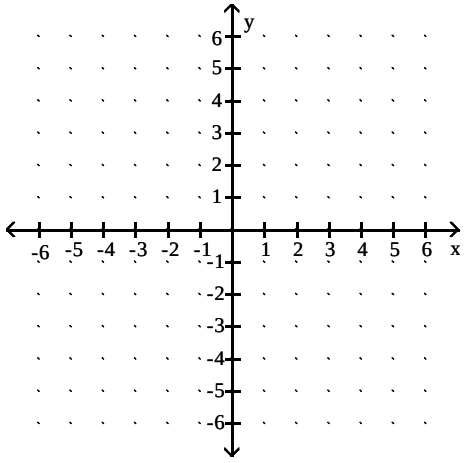
A) \$68,000 B) \$80,012 C) \$12.70 D) \$56,000

5 Graph Functions by Plotting Points

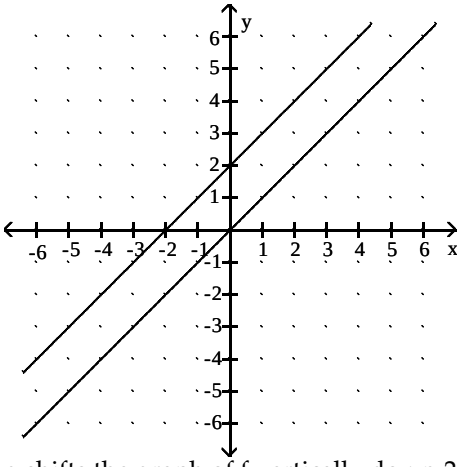
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph the given functions on the same rectangular coordinate system. Describe how the graph of g is related to the graph of f.

1) f(x) = x, g(x) = x + 2

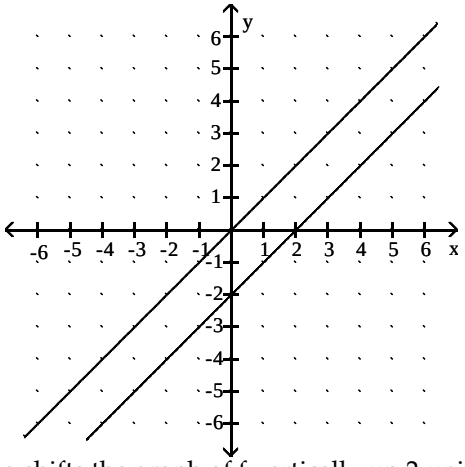


A)



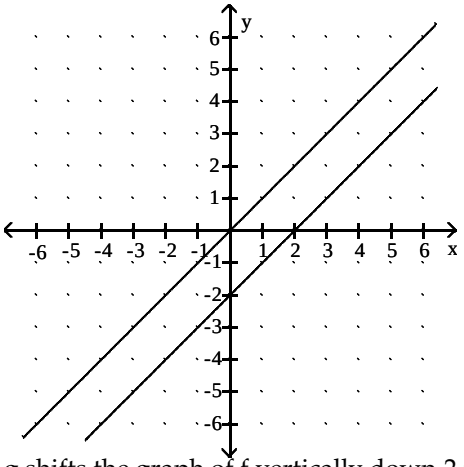
g shifts the graph of f vertically down 2 units

B)



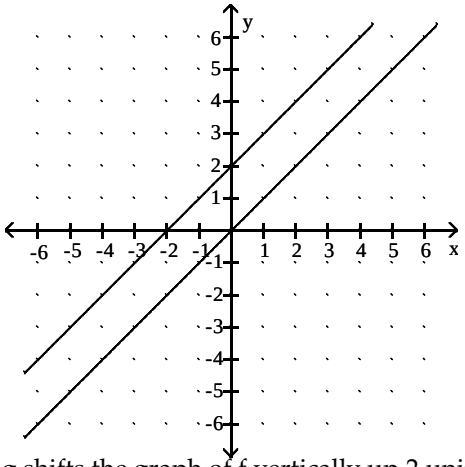
g shifts the graph of f vertically up 2 units

C)



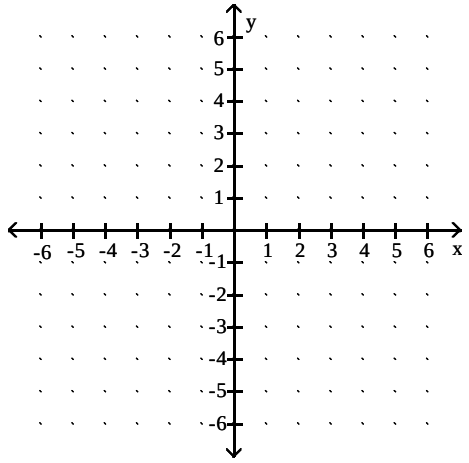
g shifts the graph of f vertically down 2 units

D)

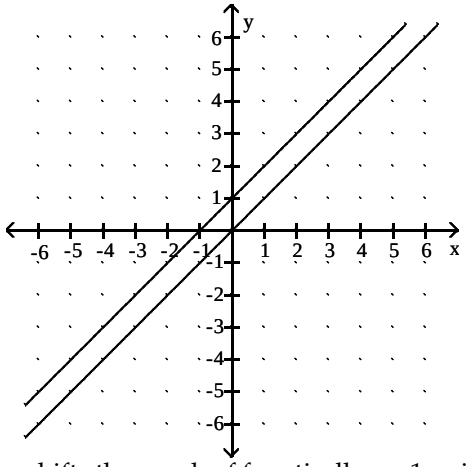


g shifts the graph of f vertically up 2 units

2) $f(x) = x$, $g(x) = x - 1$

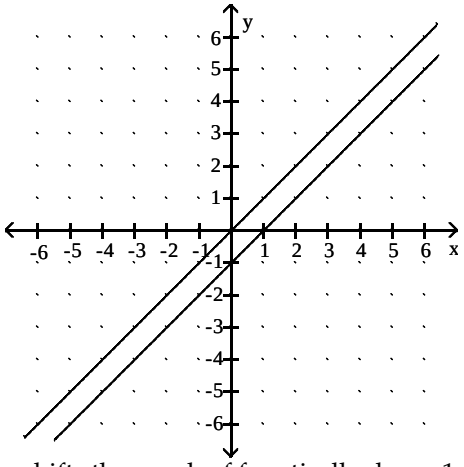


A)



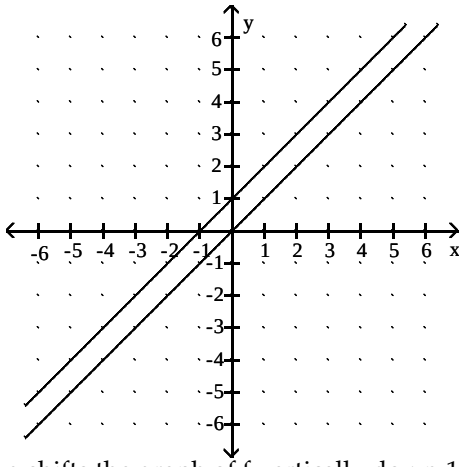
g shifts the graph of f vertically up 1 unit

B)



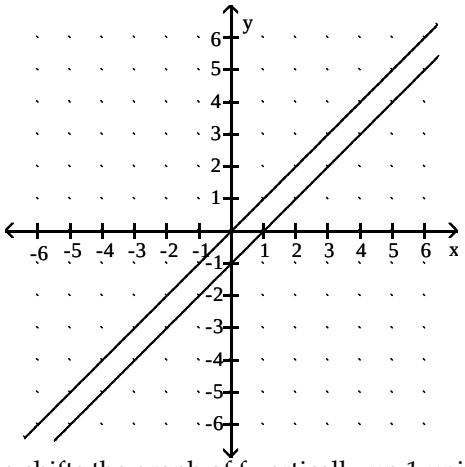
g shifts the graph of f vertically down 1 unit

C)



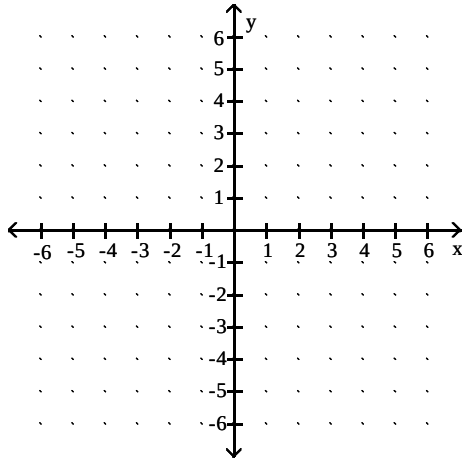
g shifts the graph of f vertically down 1 unit

D)

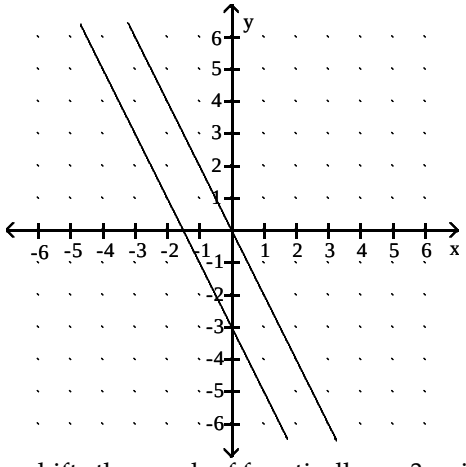


g shifts the graph of f vertically up 1 unit

3) $f(x) = -2x$, $g(x) = -2x - 3$

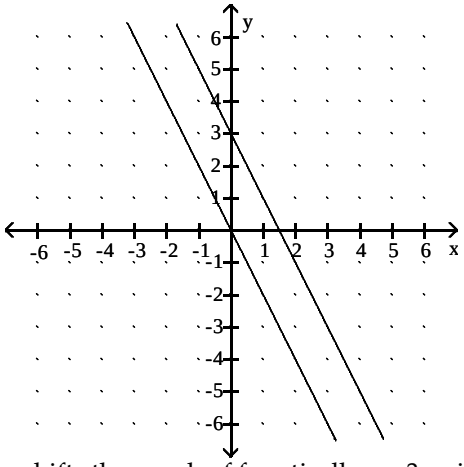


A)



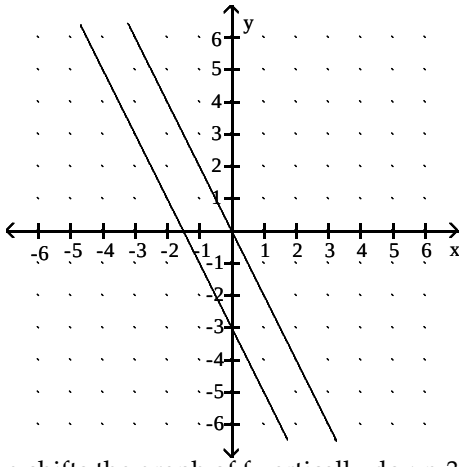
g shifts the graph of f vertically up 3 units

B)



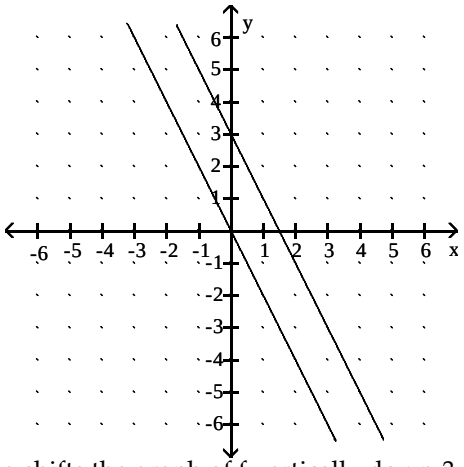
g shifts the graph of f vertically up 3 units

C)



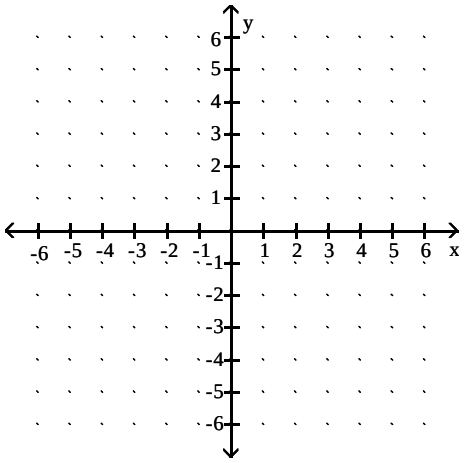
g shifts the graph of f vertically down 3 units

D)

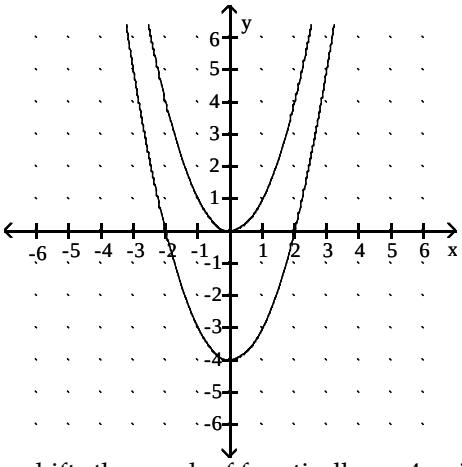


g shifts the graph of f vertically down 3 units

4) $f(x) = x^2$, $g(x) = x^2 + 4$

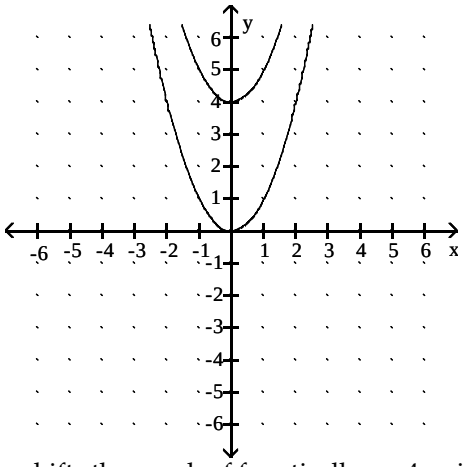


A)



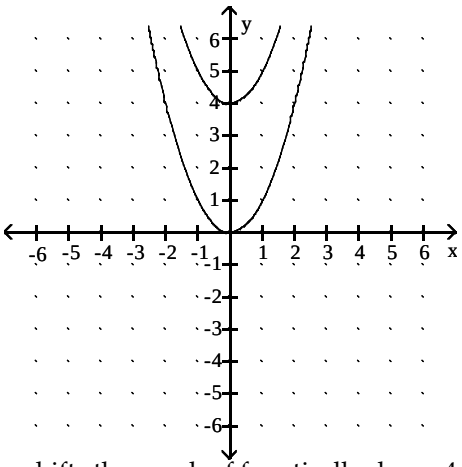
g shifts the graph of f vertically up 4 units

B)



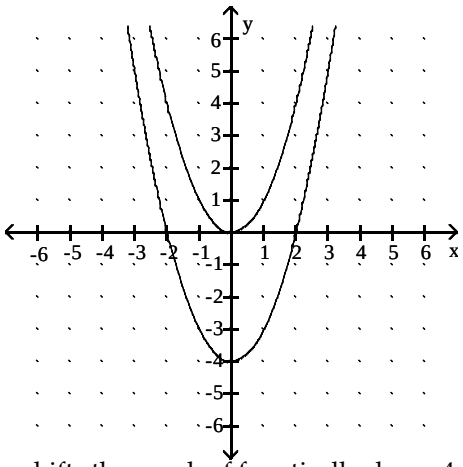
g shifts the graph of f vertically up 4 units

C)



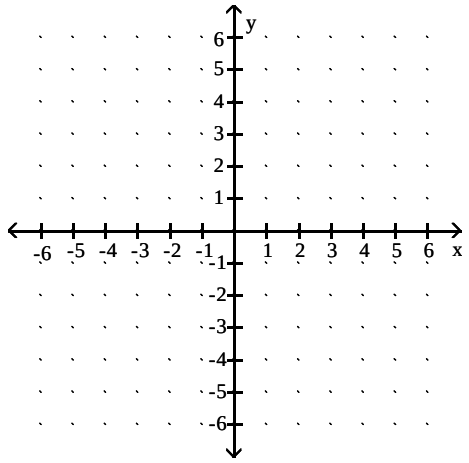
g shifts the graph of f vertically down 4 units

D)

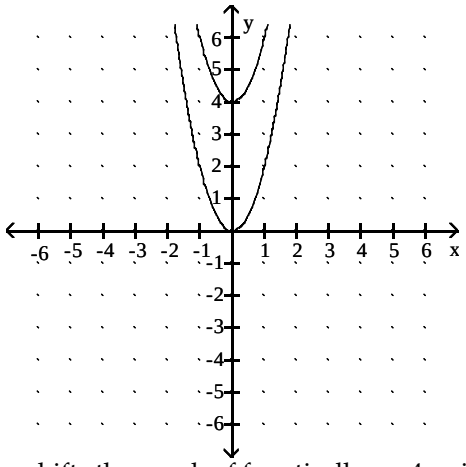


g shifts the graph of f vertically down 4 units

5) $f(x) = 2x^2$, $g(x) = 2x^2 - 4$

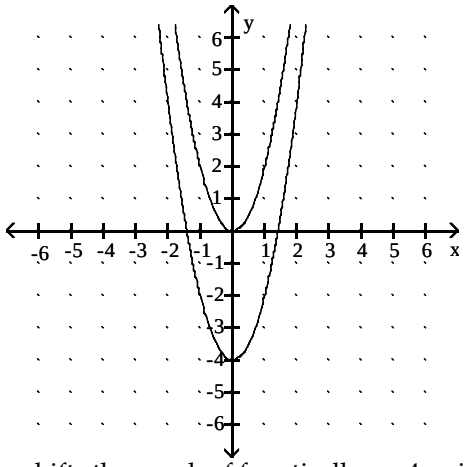


A)



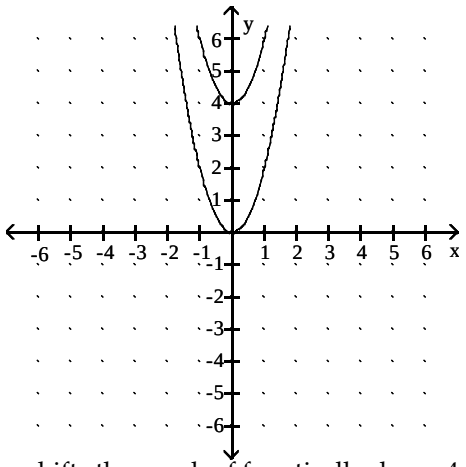
g shifts the graph of f vertically up 4 units

B)



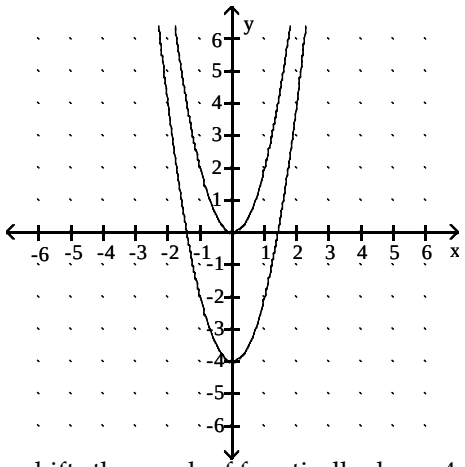
g shifts the graph of f vertically up 4 units

C)



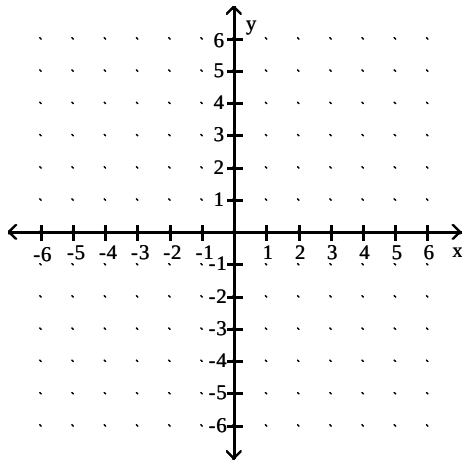
g shifts the graph of f vertically down 4 units

D)

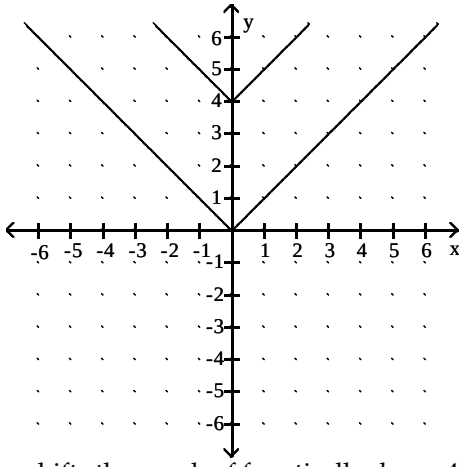


g shifts the graph of f vertically down 4 units

6) $f(x) = |x|$, $g(x) = |x| + 4$

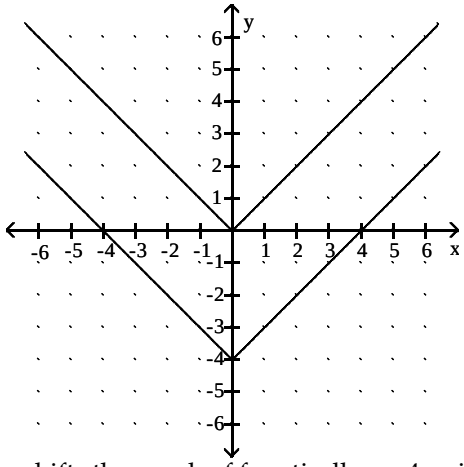


A)



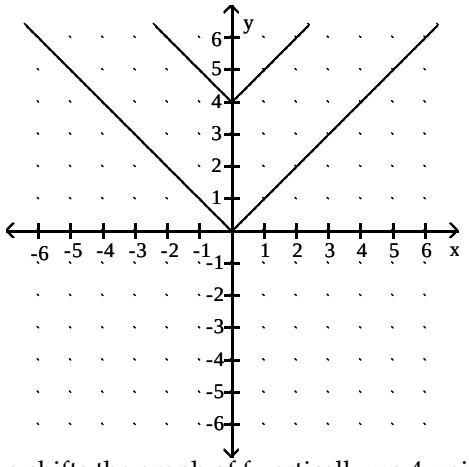
g shifts the graph of f vertically down 4 units

B)



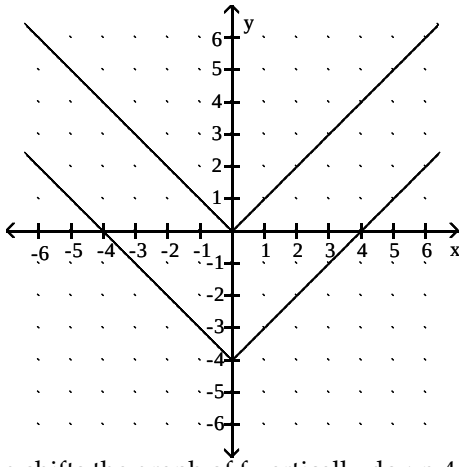
g shifts the graph of f vertically up 4 units

C)



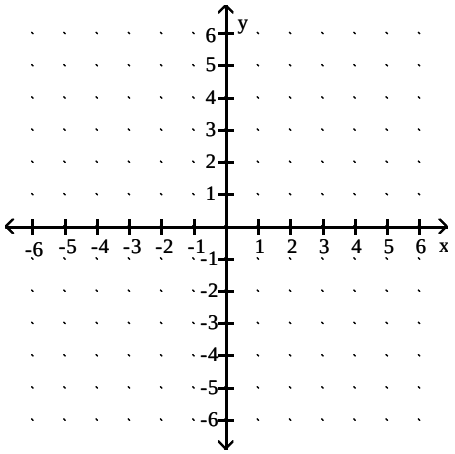
g shifts the graph of f vertically up 4 units

D)

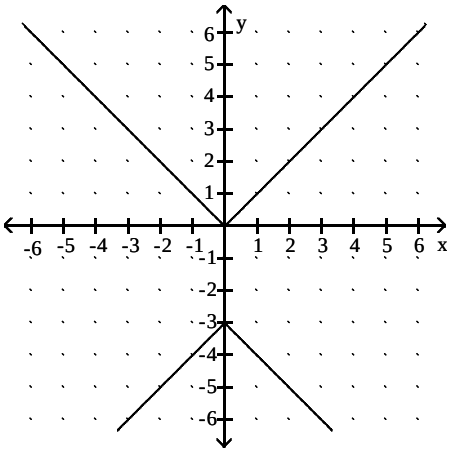


g shifts the graph of f vertically down 4 units

7) $f(x) = |x|$, $g(x) = |x| - 3$

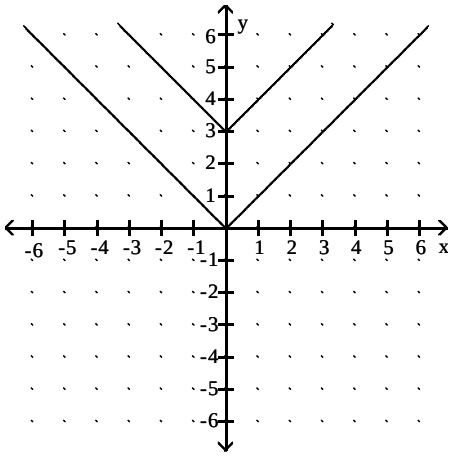


A)



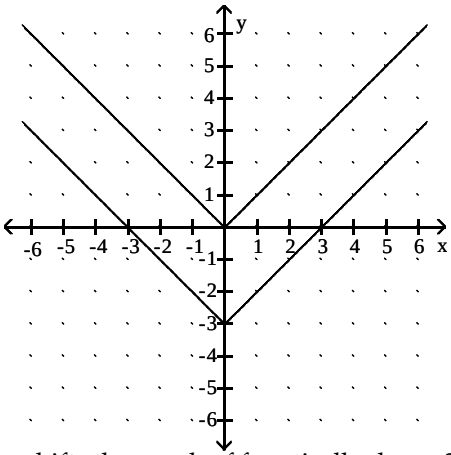
g shifts the graph of f vertically down 3 units

B)



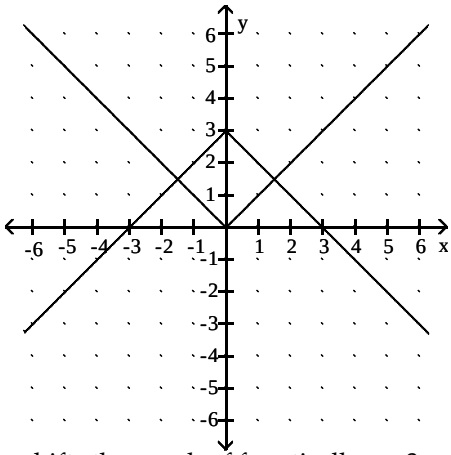
g shifts the graph of f vertically up 3 units

C)



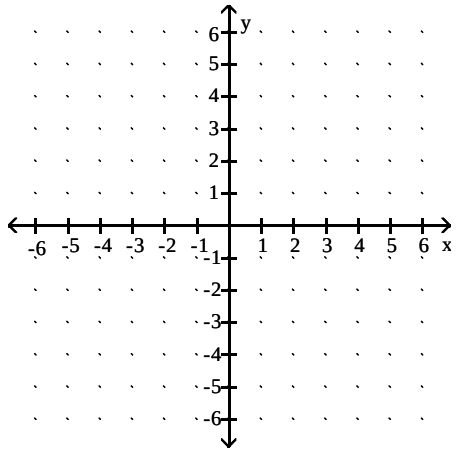
g shifts the graph of f vertically down 3 units

D)

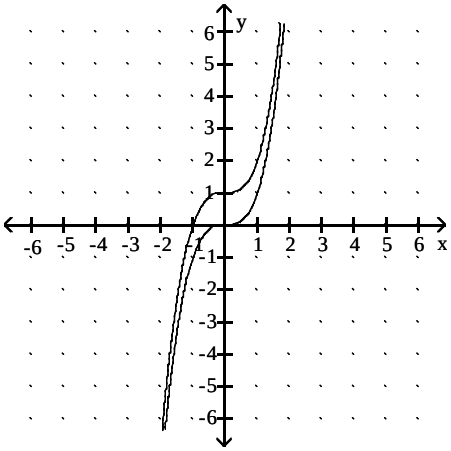


g shifts the graph of f vertically up 3 units

8) $f(x) = x^3$, $g(x) = x^3 + 1$

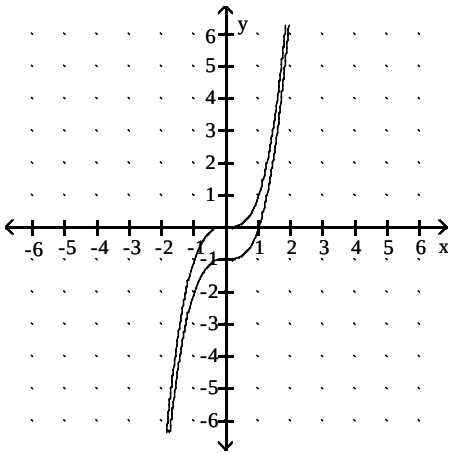


A)



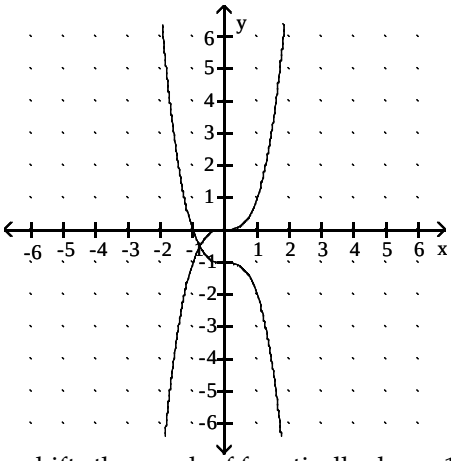
g shifts the graph of f vertically up 1 units

B)



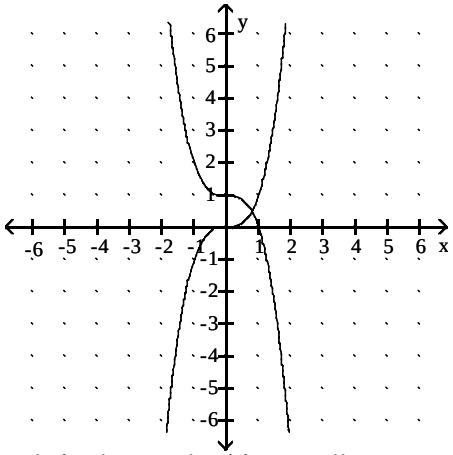
g shifts the graph of f vertically down 1 units

C)



g shifts the graph of f vertically down 1 units

D)



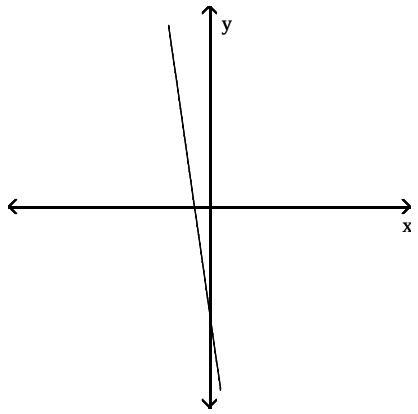
g shifts the graph of f vertically up 1 units

6 Use the Vertical Line Test to Identify Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

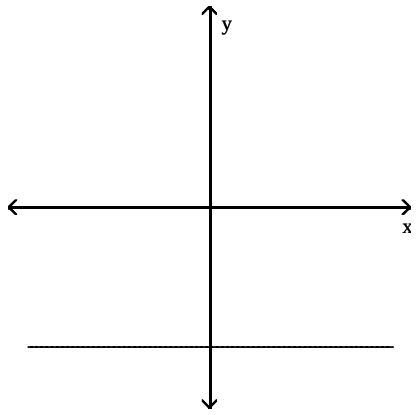
Use the vertical line test to determine whether or not the graph is a graph in which y is a function of x.

1)



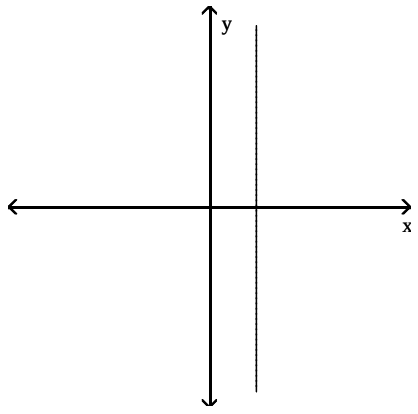
A) not a function B) function

2)



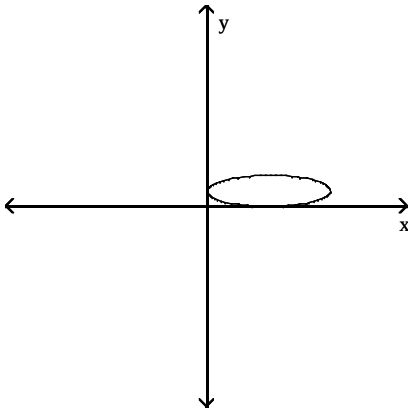
A) not a function B) function

3)



A) not a function B) function

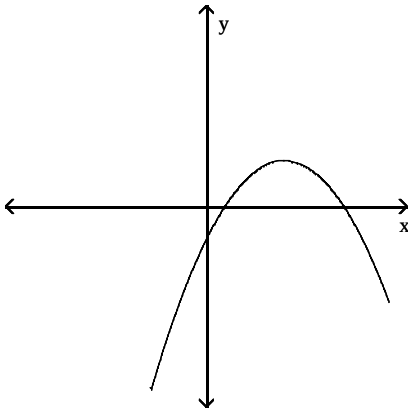
4)



A) function

B) not a function

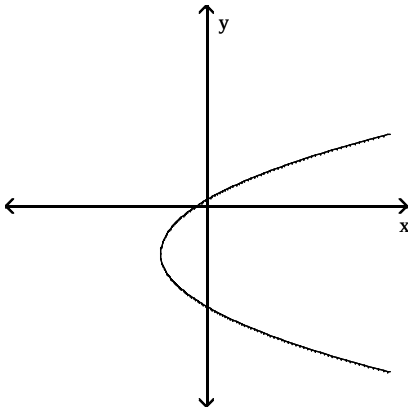
5)



A) function

B) not a function

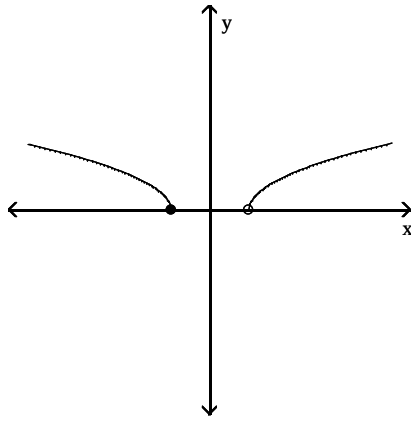
6)



A) not a function

B) function

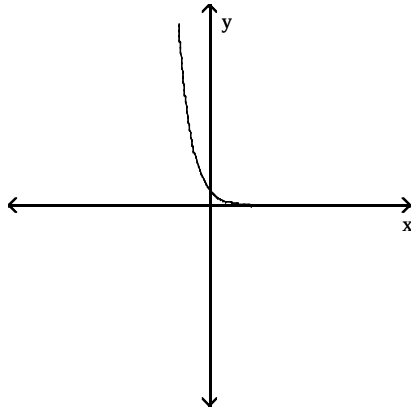
7)



A) function

B) not a function

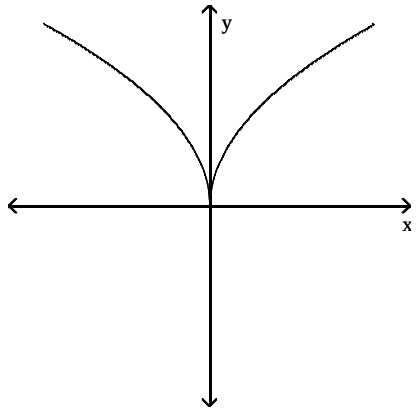
8)



A) not a function

B) function

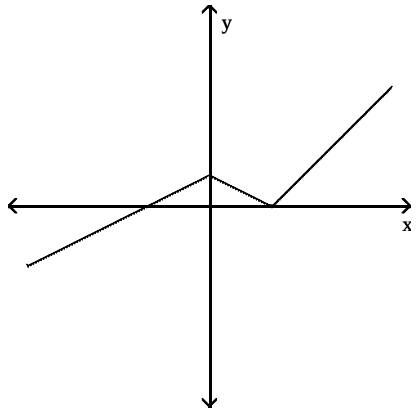
9)



A) not a function

B) function

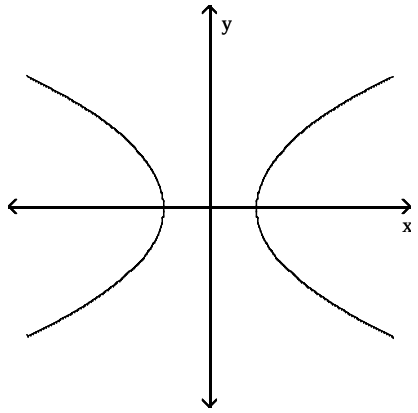
10)



A) function

B) not a function

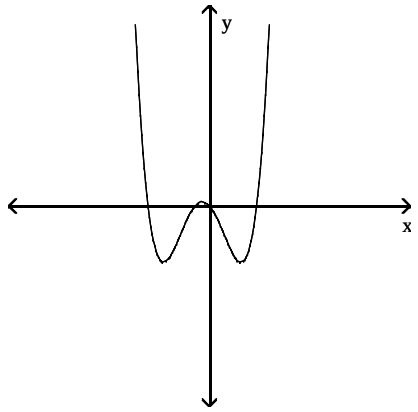
11)



A) not a function

B) function

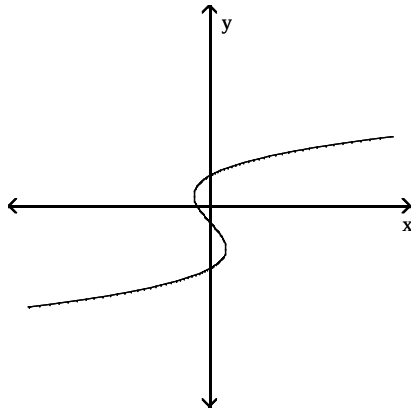
12)



A) function

B) not a function

13)



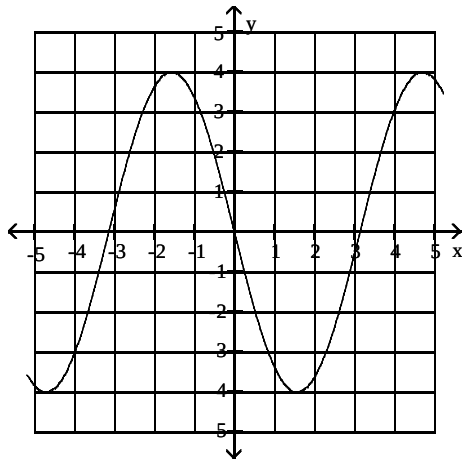
A) function B) not a function

7 Obtain Information About a Function from Its Graph

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

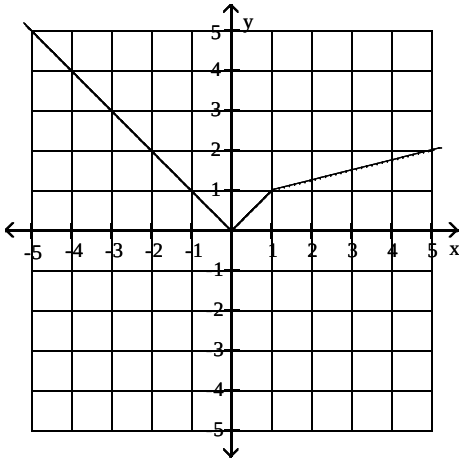
Use the graph to find the indicated function value.

1) y = f(x). Find f(4)



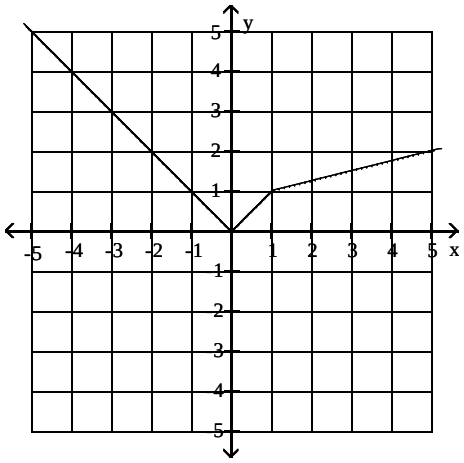
A) 1.6 B) –3 C) 3 D) –1.6

2) y = f(x). Find f(3).



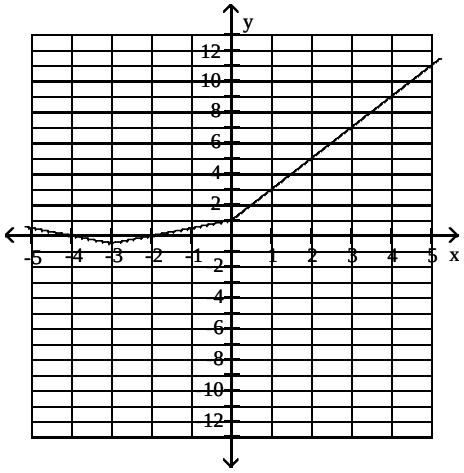
A) –3 B) 3 C) 9 D) 1.5

3) y = f(x). Find f(–3)



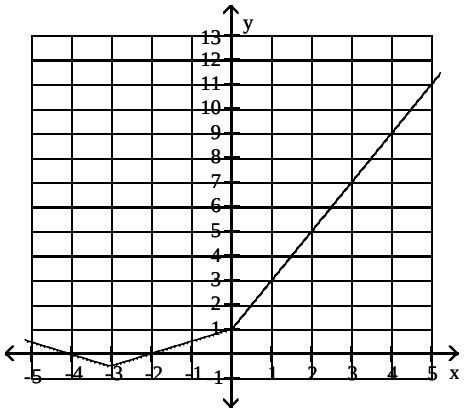
A) 9 B) –3 C) 3 D) 1.5

4) y = f(x). Find f(2)



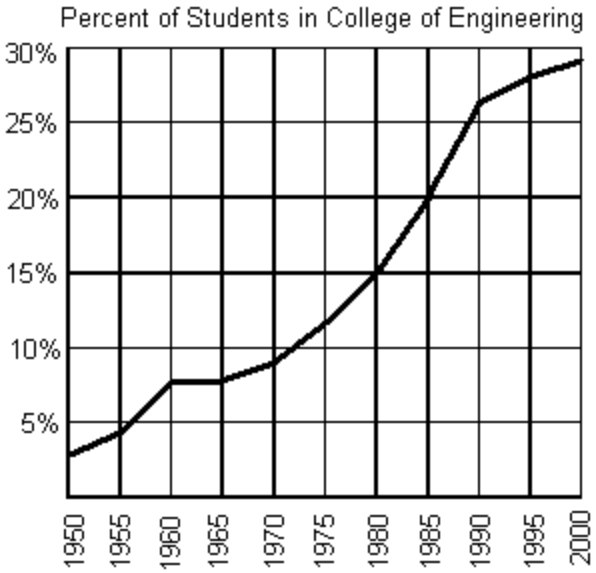
A) –5 B) 0.5 C) 3 D) 5

5) y = f(x). Find f(–3)



A) –0.5 B) 7 C) 2.5 D) 3.5

The graph below shows the percentage of students enrolled in the College of Engineering at State University. Use the graph to answer the question.



6) Does the graph represent a function?

A) yes B) no

7) If f represents the function, find f(1960).

A) approximately 4% B) approximately 9.5%

C) approximately 2.5% D) approximately 7.5%

8) If f(x) = 28%, what year is represented by x?

A) 1990 B) 1995 C) 1985 D) 2000

9) Between what two years is the difference in function values equal to 5%?

A) between 1985 and 1990 B) between 1960 and 1965

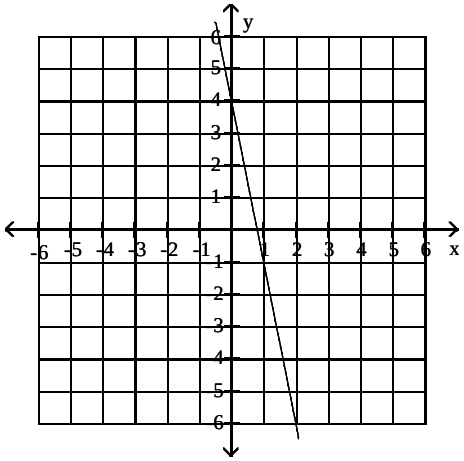
C) between 1980 and 1985 D) between 1970 and 1975

8 Identify the Domain and Range of a Function from Its Graph

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the graph to determine the function's domain and range.

1)



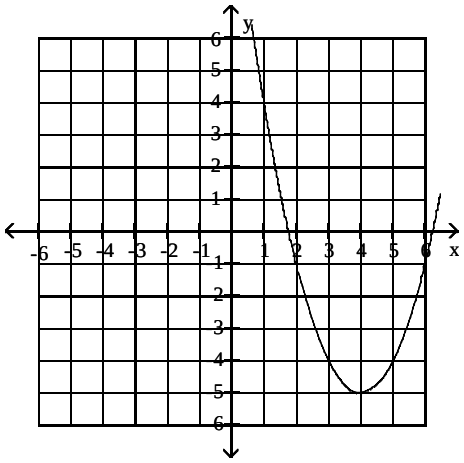
A) domain: $x = \frac{4}{5}$
range: $y = 4$

B) domain: $(-\infty, \infty)$
range: $(-\infty, \infty)$

C) domain: $x = \frac{4}{5}$
range: $(-\infty, \infty)$

D) domain: $(-\infty, \infty)$
range: $y = 4$

2)



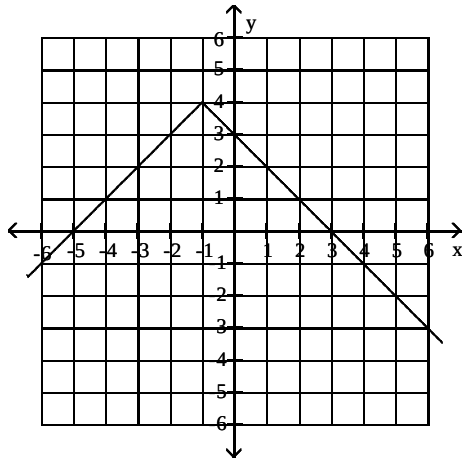
A) domain: $(-\infty, \infty)$
range: $(-\infty, \infty)$

B) domain: $(-\infty, \infty)$
range: $[-5, \infty)$

C) domain: $(-\infty, 4)$ or $(4, \infty)$
range: $(-\infty, -5)$ or $(-5, \infty)$

D) domain: $[4, \infty)$
range: $[-5, \infty)$

3)



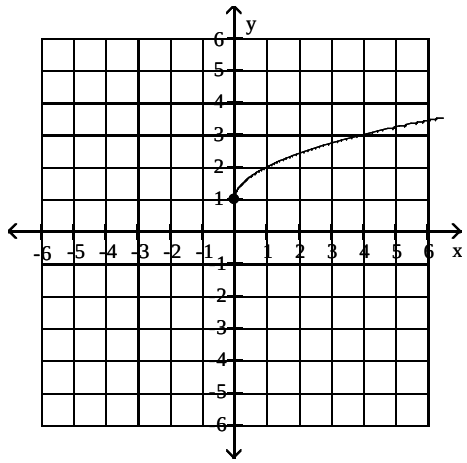
A) domain: (−∞, −1]
range: (−∞, 4]

B) domain: (−∞, ∞)
range: (−∞, ∞)

C) domain: (−∞, −1) or (−1, ∞)
range: (−∞, 4) or (4, ∞)

D) domain: (−∞, ∞)
range: (−∞, 4]

4)



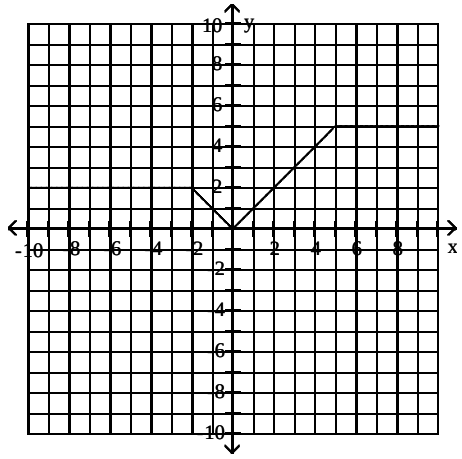
A) domain: [0, ∞)
range: [0, ∞)

B) domain: (−∞, ∞)
range: [1, ∞)

C) domain: [0, ∞)
range: [1, ∞)

D) domain: [0, ∞)
range: (−∞, ∞)

5)



A) domain: (−∞, ∞)
range: [2, 5]

B) domain: [2, 5]
range: (−∞, ∞)

C) domain: (−∞, ∞)
range: [0, 5]

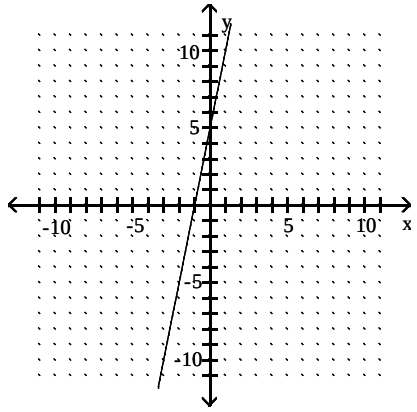
D) domain: [0, 5]
range: (−∞, ∞)

9 Identify Intercepts from a Function's Graph.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify the intercepts.

1)



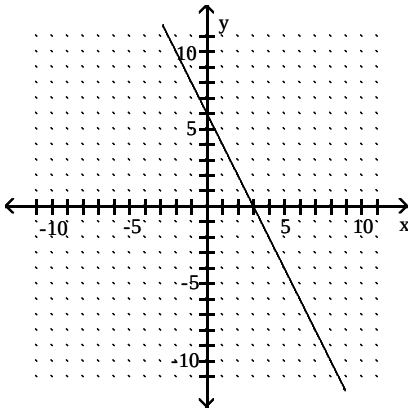
A) (–1, 0), (0, –5)

B) (–5, 0), (0, 5)

C) (1, 0), (0, 5)

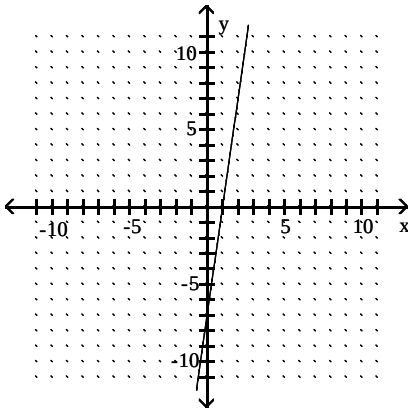
D) (–1, 0), (0, 5)

2)



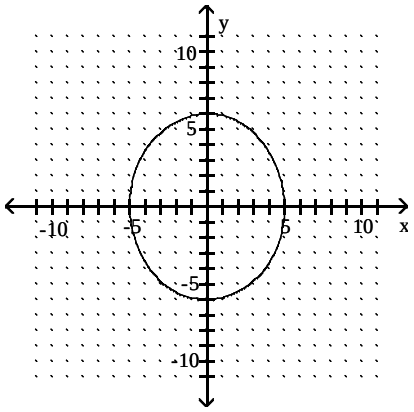
A) (3, 0), (0, 6) B) (–6, 0), (0, 6) C) (–3, 0), (0, 6) D) (3, 0), (0, –6)

3)



A) (1, 0), (0, 7) B) (–1, 0), (0, –7) C) (1, 0), (0, –7) D) (–7, 0), (0, 7)

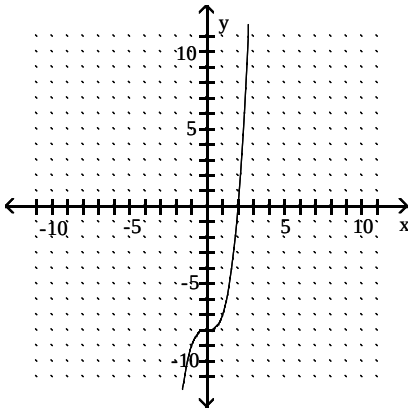
4)



A) (5, 0), (–5, 0) B) (0, 6), (0, –6)

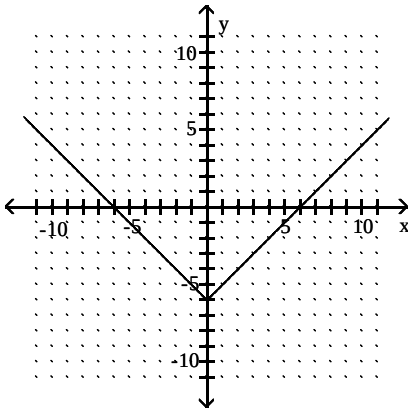
C) (5, 0), (–5, 0), (0, 6), (0, –6) D) (6, 0), (–6, 0), (0, 5), (0, –5)

5)



A) (2, 0), (0, 8) B) (–2, 0), (0, –8) C) (2, 2), (–8, –8) D) (2, 0), (0, –8)

6)



A) (6, 0), (–6, 0) B) (6, 0), (–6, 0), (0, –6)

C) (6, 0), (–6, 0), (0, 0) D) (0, –6)

1.3 More on Functions and Their Graphs

1 Find and Simplify a Function's Difference Quotient

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$ for the given function.

1) $f(x) = 7x + 9$

A) $7 + \frac{14(x+9)}{h}$ B) 7 C) $7 + \frac{18}{h}$ D) 0

2) $f(x) = 9x^2$

A) $\frac{9(2x^2 + 2xh + h^2)}{h}$ B) $\frac{18}{h} + x + 9h$ C) 9 D) 9(2x+h)

3) $f(x) = 7$

A) 0 B) $1 + \frac{14}{h}$ C) 7 D) 1

4) $f(x) = \dfrac{1}{6x}$

A) $\dfrac{-1}{x\,(x + h)}$ B) 0 C) $\dfrac{1}{6x}$ D) $\dfrac{-1}{6x\,(x + h)}$

5) $f(x) = x^2 + 8x + 5$

A) 1 B) $\dfrac{2x^2 + 2x + 2xh + h^2 + h + 10}{h}$

C) $2x + h + 8$ D) $2x + h + 5$

2 Understand and Use Piecewise Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate the piecewise function at the given value of the independent variable.

1)

$$f(x) = \begin{cases} 4x + 5 & \text{if } x < 5 \\ -3x - 4 & \text{if } x \geq 5 \end{cases}$$

Determine f(3).

A) 13 B) –4 C) 17 D) 12

2)

$$f(x) = \begin{cases} 5x + 3 & \text{if } x < -4 \\ 2x - 1 & \text{if } x \geq -4 \end{cases}$$

Determine f(–1).

A) 1 B) –3 C) –6 D) 0

3)

$$f(x) = \begin{cases} x - 4 & \text{if } x > -2 \\ -(x - 4) & \text{if } x \leq -2 \end{cases}$$

Determine f(–4).

A) –4 B) –8 C) 19 D) 8

4)

$$g(x) = \begin{cases} \dfrac{x^2 + 8}{x + 4} & \text{if } x \neq -4 \\ x - 2 & \text{if } x = -4 \end{cases}$$

Determine g(–5).

A) –7 B) – 33 C) – 3 D) –5

5)

$$g(x) = \begin{cases} \dfrac{x^2 - 8}{x - 3} & \text{if } x \neq 3 \\ x + 6 & \text{if } x = 3 \end{cases}$$

Determine g(3).

A) Undefined B) 9 C) –3 D) –9

Solve the problem.

6) Suppose a car rental company charges $72 for the first day and $22 for each additional or partial day. Let S(x) represent the cost of renting a car for x days. Find the value of S(5.5).

A) $171 B) $193 C) $182 D) $121

7) Suppose a life insurance policy costs $20 for the first unit of coverage and then $5 for each additional unit of coverage. Let C(x) be the cost for insurance of x units of coverage. What will 10 units of coverage cost?

A) $70 B) $65 C) $30 D) $50

8) A salesperson gets a commission of $1000 for the first $10,000 of sales, and then $500 for each additional $10,000 or partial of sales. Let S(x) represent the commission on x dollars of sales. Find the value of S(45,000).

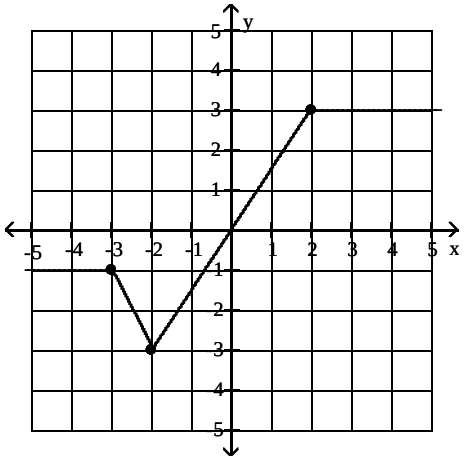
A) $2250 B) 3250 C) $2750 D) $3000

3 Identify Intervals on Which a Function Increases, Decreases, or is Constant

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

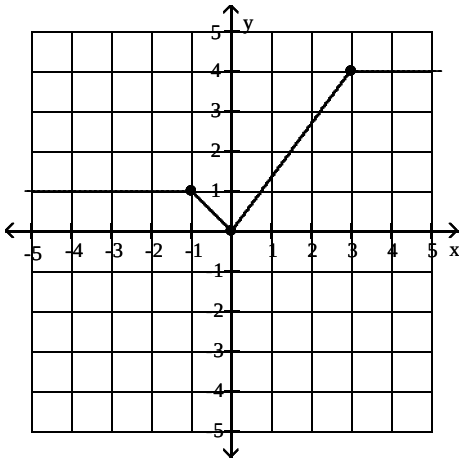
Identify the intervals where the function is changing as requested.

1) Increasing



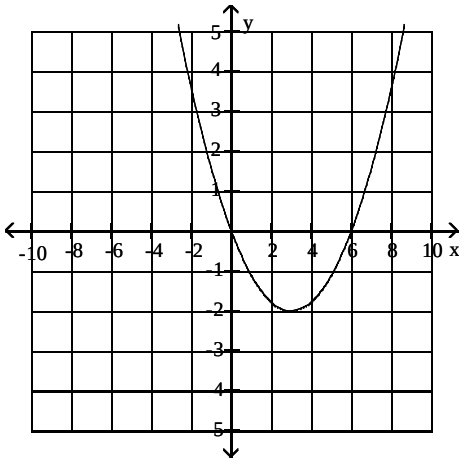
A) (–3, ∞) B) (–3, 3) C) (–2, ∞) D) (–2, 2)

2) Constant



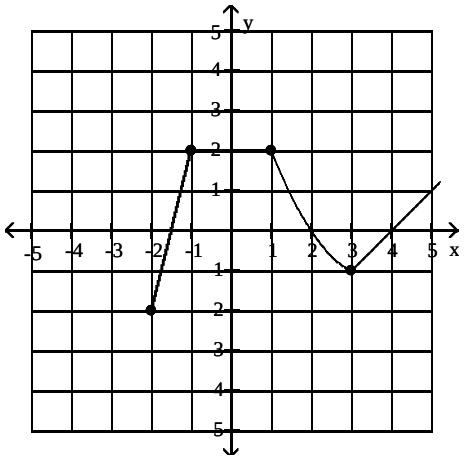
A) (–1, 0) B) (–∞, –1) or (3, ∞) C) (3, ∞) D) (–∞, 0)

3) Increasing



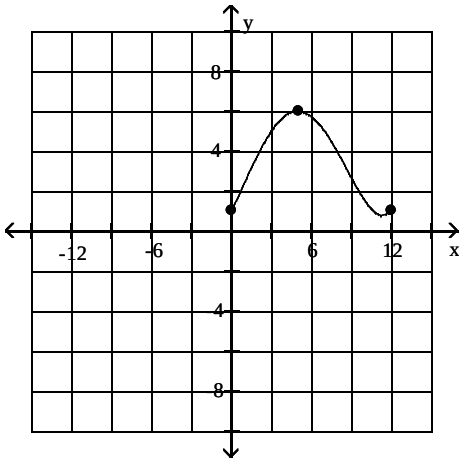
A) (–2, 0) B) (3, 6) C) (3, ∞) D) (–2, ∞)

4) Increasing



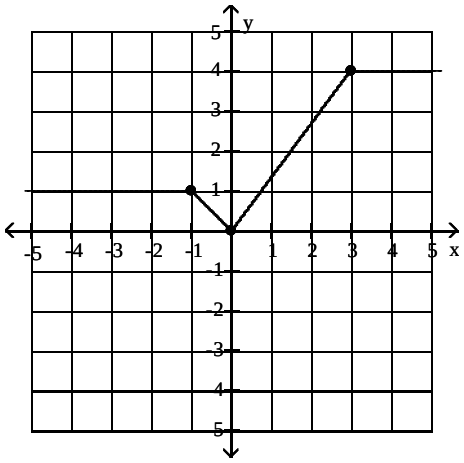
A) (–2, –1) or (3, ∞) B) (–1, ∞) C) (–1, 3) D) (–2, 1)

5) Increasing



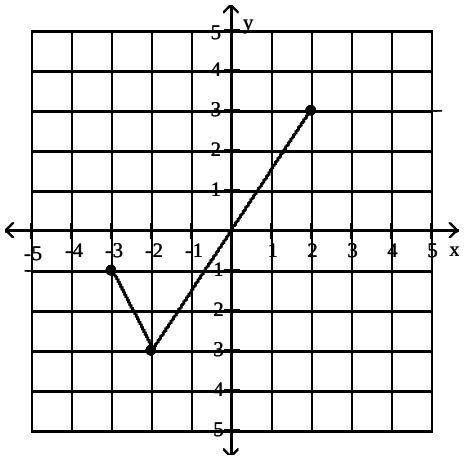
A) (0, 5) B) (1, 5) C) (1, 6) D) (0, 6)

6) Increasing



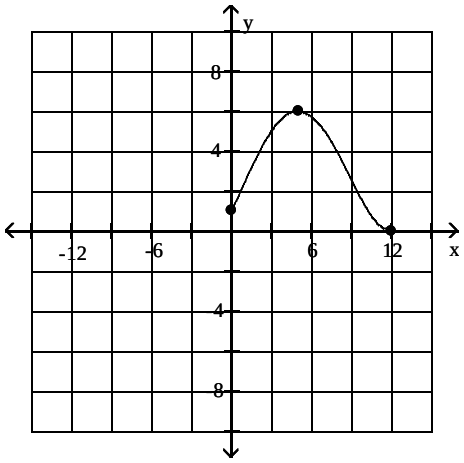
A) (0, 3) B) (–1, 0) C) (–∞, –1) D) (–∞, 0)

7) Decreasing



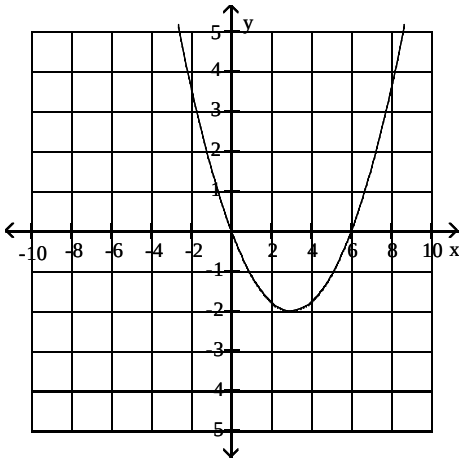
A) (0, –2) B) (–∞, –3) C) (–∞, –2) D) (–3, –2)

8) Decreasing



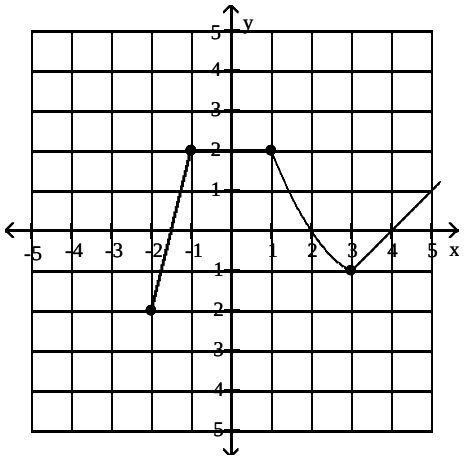
A) (6, 1) B) (5, 12) C) (5, 1) D) (6, 12)

9) Decreasing



A) (0, 3) B) (0, –2) C) (–∞, –2) D) (–∞, 3)

10) Constant



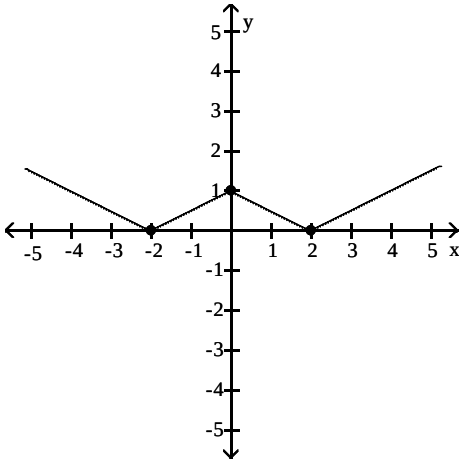
A) (–2, –1) B) (2, ∞) C) (1, 2) D) (–1, 1)

4 Use Graphs to Locate Relative Maxima or Minima

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The graph of a function f is given. Use the graph to answer the question.

1) Find the numbers, if any, at which f has a relative maximum. What are the relative maxima?



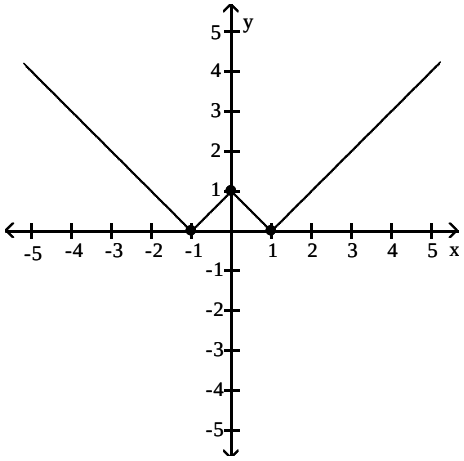
A) f has a relative maximum at x = 2; the relative maximum is 1

B) f has a relative maximum at x = –2 and 2; the relative maximum is 0

C) f has a relative maximum at x = 0; the relative maximum is 1

D) f has no relative maximum

2) Find the numbers, if any, at which f has a relative minimum. What are the relative minima?



A) f has a relative minimum at x = –1; the relative minimum is 0

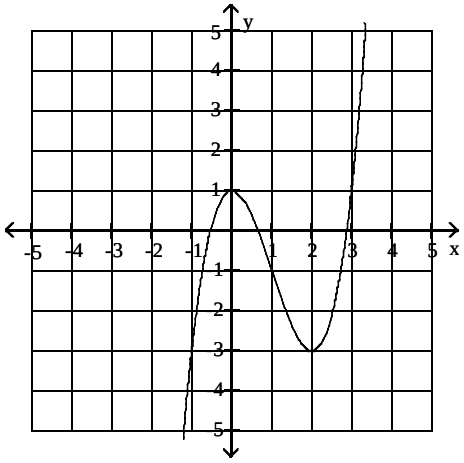
B) f has a relative minimum at x = 0; the relative minimum is 1

C) f has a relative minimum at x = –1 and 1; the relative minimum is 0

D) f has no relative minimum

Use the graph of the given function to find any relative maxima and relative minima.

3) $f(x) = x^3 - 3x^2 + 1$



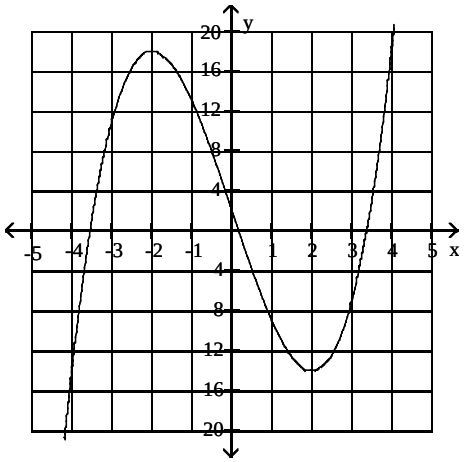
A) maximum: (0, 1); minimum: none

B) no maximum or minimum

C) maximum: none; minimum: (2, –3)

D) maximum: (0, 1); minimum: (2, –3)

4) $f(x) = x^3 - 12x + 2$



A) no maximum or minimum

B) maximum: (–2, 18) and (0, 0); minimum: (2, –14)

C) minimum: (2, –14); maximum: (–2, 18)

5 Identify Even or Odd Functions and Recognize Their Symmetries

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the given function is even, odd, or neither.

1) $f(x) = x^3 - 4x$

A) Odd

B) Neither

C) Even

2) $f(x) = 3x^2 + x^4$

A) Neither

B) Even

C) Odd

3) $f(x) = x^4 - x^3$

A) Odd B) Neither C) Even

4) $f(x) = -5x^5 + x^3$

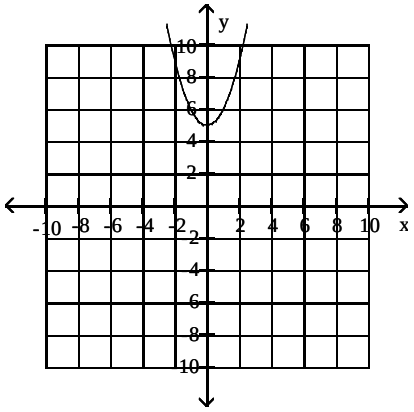
A) Even B) Neither C) Odd

5) $f(x) = x^3 + x^2 + 2$

A) Odd B) Even C) Neither

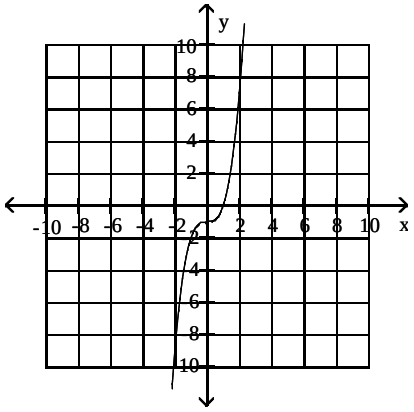
Use possible symmetry to determine whether the graph is the graph of an even function, an odd function, or a function that is neither even nor odd.

6)



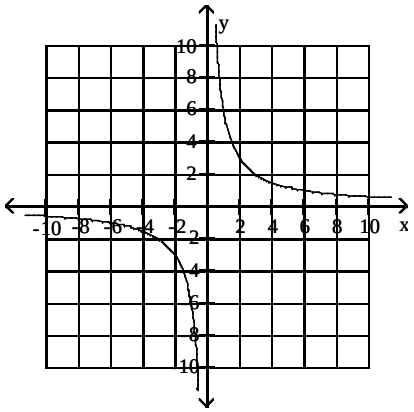
A) Neither B) Even C) Odd

7)



A) Neither B) Even C) Odd

8)



A) Even B) Odd C) Neither

6 Graph Step Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

If f(x) = int (x), find the function value.

1) f(−51)

A) −50 B) −52 C) −51 D) 1

2) f(−95.36)

A) −95.36 B) −96.36 C) −96 D) −95

3) f(−42.7501)

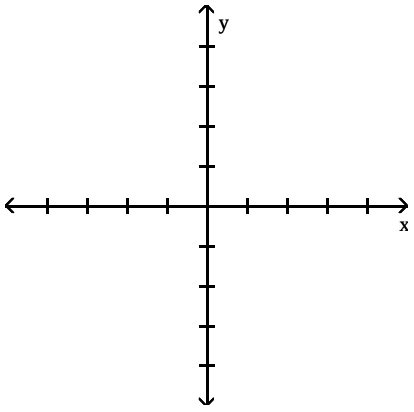
A) −43.7501 B) −42.7501 C) −43 D) −42

4) f($-\frac{1}{4}$)

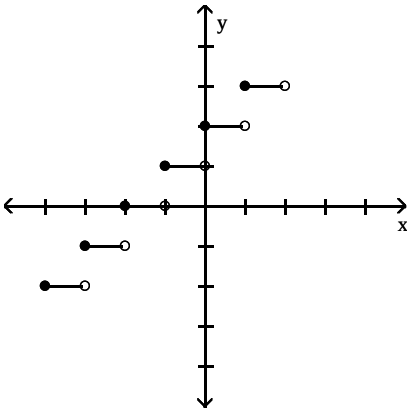
A) −1.25 B) −0.25 C) 0 D) −1

Graph the function.

5) f(x) = int (x) + 1



A)



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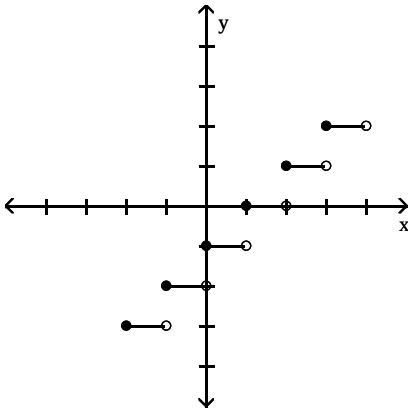
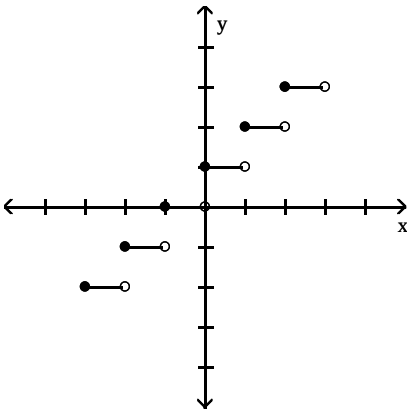
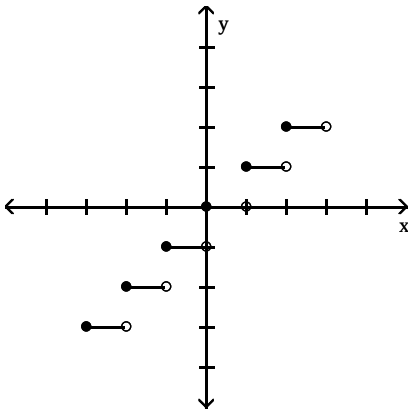


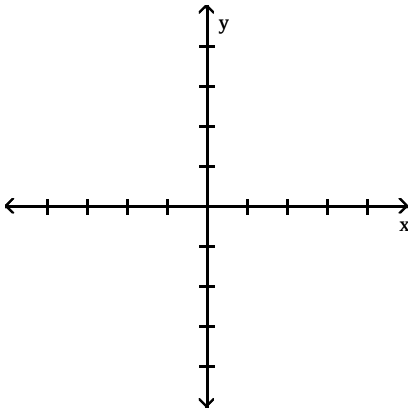
C)



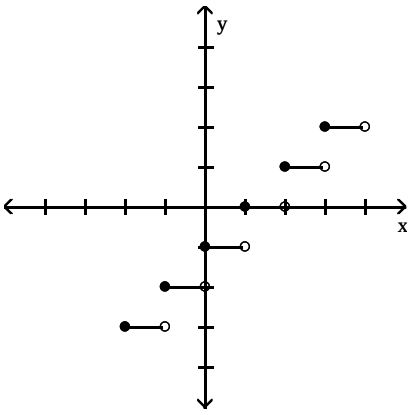
D)



6) f(x) = int (x)



A)



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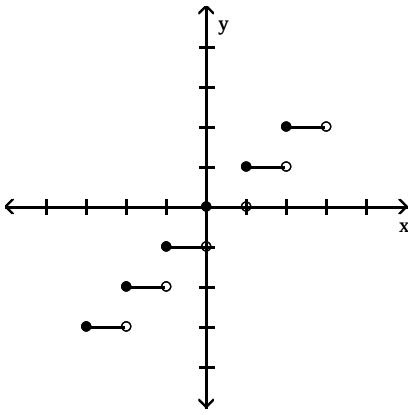

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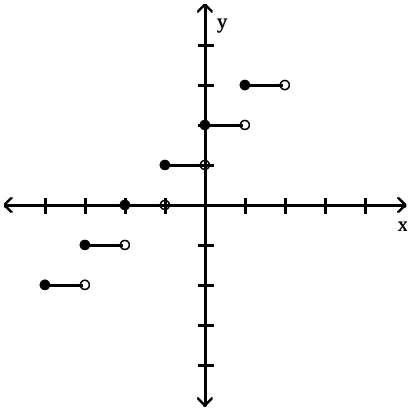

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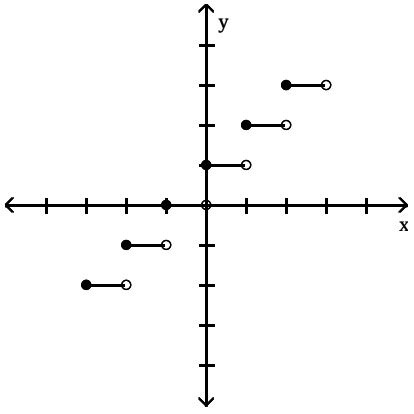
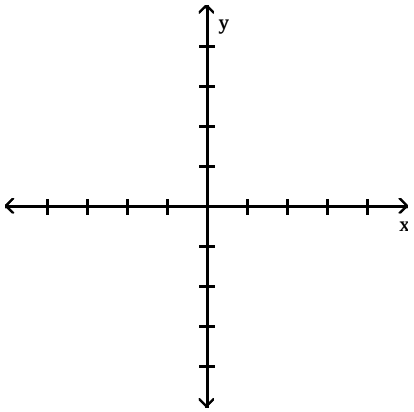
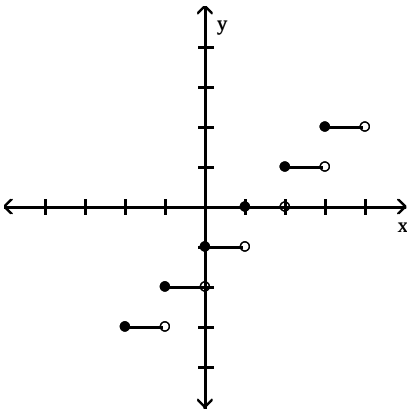


7) f(x) = int (x)– 1



A)



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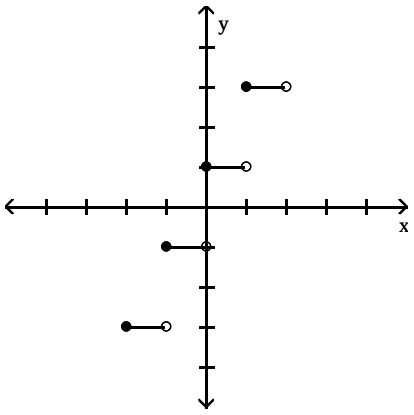

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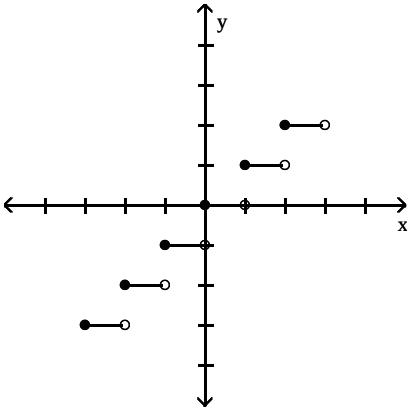
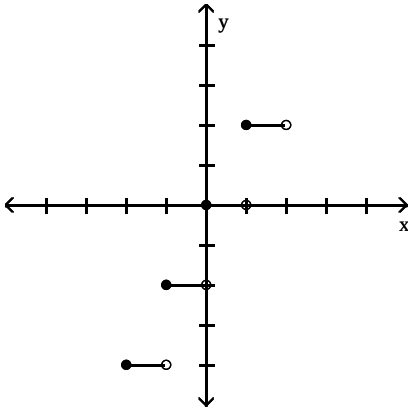
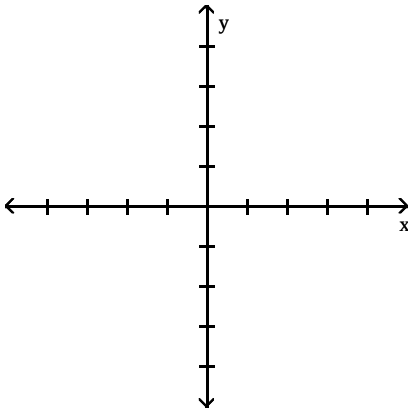


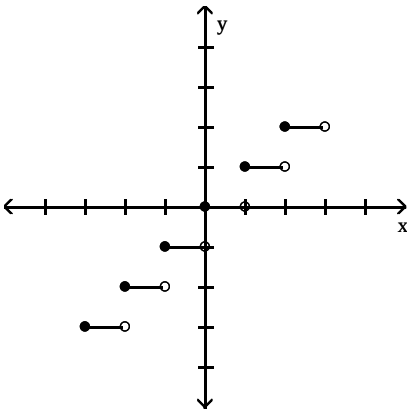
D)



8) f(x) = int (x – 1)



A)



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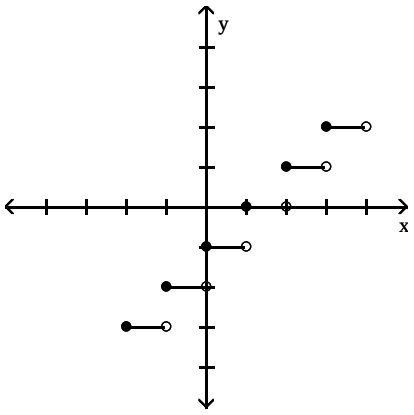

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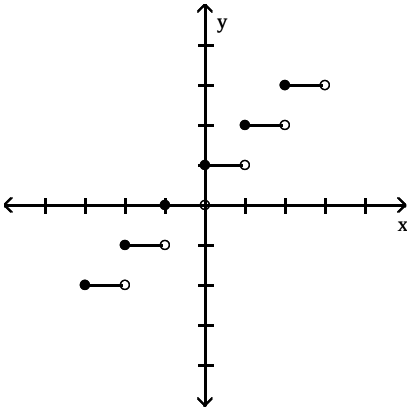

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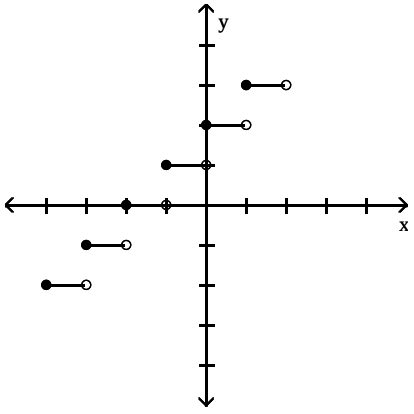
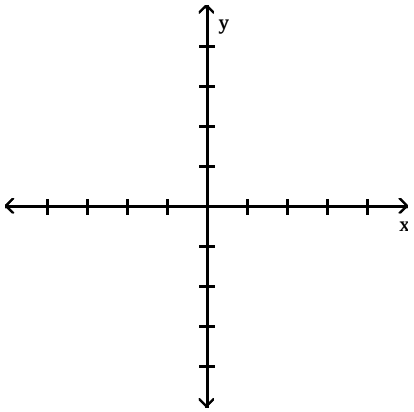
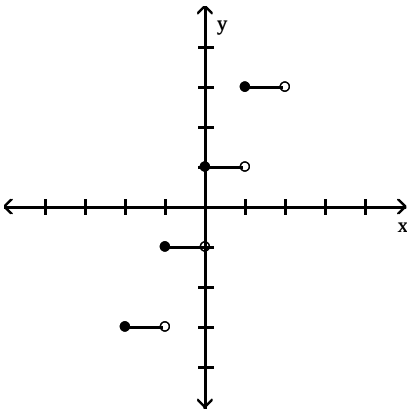


9) f(x) = 2(int (x))



A)



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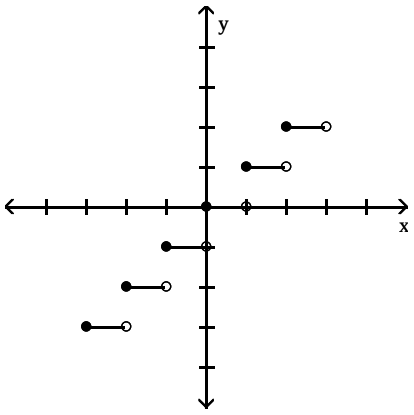

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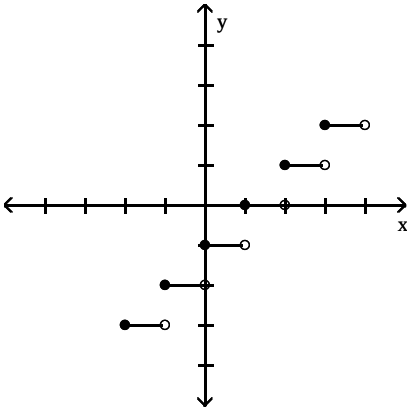

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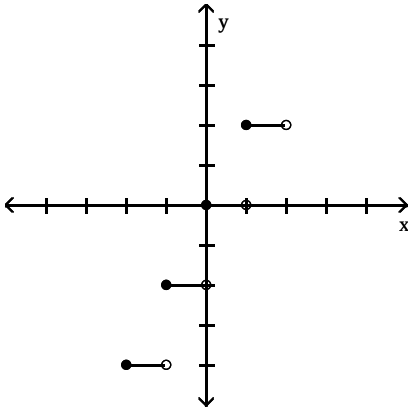
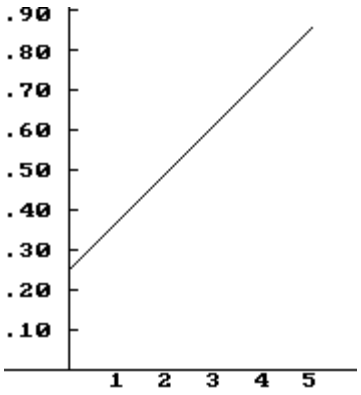


Solve the problem.

10) Assume it costs 25 cents to mail a letter weighing one ounce or less, and then 20 cents for each additional ounce or fraction of an ounce. Let L(x) be the cost of mailing a letter weighing x ounces. Graph y = L(x).

A)



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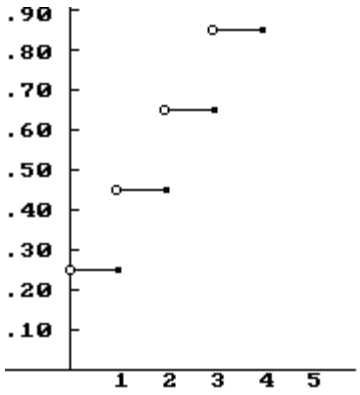


1.4 Linear Functions and Slope

1 Calculate a Line's Slope

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the slope of the line that goes through the given points.

1) (–8, 2), (5, 4)

A) – 2 B) $-\frac{2}{13}$ C) $\frac{13}{2}$ D) $\frac{2}{13}$

2) (–1, 1), (–1, 5)

A) 0 B) 2 C) Undefined D) – 3

3) (1, –4), (7, –4)

A) $-\frac{4}{3}$ B) Undefined C) 0 D) – 1

4) (–13, 13), (–17, –11)

A) 6 B) $-\frac{1}{15}$ C) – 6 D) $\frac{1}{6}$

5) (–3, 9), (–9, –5)

A) 3 B) $\frac{7}{3}$ C) $\frac{1}{3}$ D) $\frac{3}{7}$

6) (–9, –9), (2, –9)

A) 0 B) 3 C) –3 D) 1

7) (–3, 2) and $(\frac{2}{5}, 5)$

A) $\frac{17}{15}$ B) $\frac{15}{17}$ C) $-\frac{17}{15}$ D) $\frac{35}{17}$

8) $(\frac{3}{4}, 4)$ and $(\frac{3}{4}, 1)$

A) $\frac{20}{3}$ B) Undefined C) $-\frac{1}{4}$ D) -4

2 Write the Point–Slope Form of the Equation of a Line

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the given conditions to write an equation for the line in point–slope form.

1) Slope = –2, passing through (6, 2)

A) $y + 2 = -2(x + 6)$ B) $x - 2 = -2(y - 6)$ C) $y = -2x + 14$ D) $y - 2 = -2(x - 6)$

2) Slope = 2, passing through (–5, 4)

A) $y = 2x + 14$ B) $y - 4 = 2(x + 5)$ C) $x - 4 = 2(y + 5)$ D) $y + 4 = 2(x - 5)$

3) Slope = $\frac{2}{3}$, passing through (4, 8)

A) $y = \frac{2}{3}x + 4$ B) $x - 8 = \frac{2}{3}(y - 4)$ C) $y + 8 = \frac{2}{3}(x + 4)$ D) $y - 8 = \frac{2}{3}(x - 4)$

4) Passing through (6, 5) and (7, 2)

A) $y + 5 = -3(x + 6)$ or $y + 2 = -3(x + 7)$

B) $y - 5 = 6(x + 6)$ or $y - 2 = 7(x - 5)$

C) $y - 5 = -3(x - 6)$ or $y - 2 = -3(x - 7)$

D) $y - 5 = -3(x - 7)$ or $y - 2 = -3(x - 6)$

5) Passing through (–5, –3) and (–2, –8)

A) $y + 3 = -\frac{5}{3}x - 5$ or $y + 8 = -\frac{5}{3}x + 3$

B) $y - 3 = -\frac{5}{3}(x - 5)$ or $y - 8 = -\frac{5}{3}(x - 2)$

C) $y + 3 = -\frac{5}{3}(x + 5)$ or $y + 8 = -\frac{5}{3}(x + 2)$

D) $y + 3 = -\frac{5}{3}(x + 2)$ or $y + 8 = -\frac{5}{3}(x + 5)$

6) Passing through (2, –3) with x–intercept = –2

A) $y - 2 = -\frac{3}{4}x$ or $y - 3 = -\frac{3}{4}(x + 2)$

B) $y + 2 = 3x$ or $y - 3 = 3(x - 2)$

C) $y + 3 = -\frac{3}{4}(x - 2)$ or $y = -\frac{3}{4}(x + 2)$

D) $y - 2 = -\frac{3}{4}x$ or $y + 3 = -\frac{3}{4}(x - 2)$

3 Write and Graph the Slope–Intercept Form of the Equation of a Line

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the given conditions to write an equation for the line in slope–intercept form.

1) Slope = –3, passing through (7, 8)

A) $y - 8 = -3x - 7$ B) $y = -3x + 29$ C) $y = -3x - 29$ D) $y - 8 = x - 7$

2) Slope = –4, passing through (–6, 2)

A) $y = -4x + 22$ B) $y - 2 = -4x + 6$ C) $y - 2 = x + 6$ D) $y = -4x - 22$

3) Slope $= \frac{2}{3}$, passing through (6, 5)

A) $y = \frac{2}{3}x + 1$ B) $y = mx + 1$ C) $y = \frac{2}{3}x - 1$ D) $y = \frac{2}{3}x + 6$

4) Slope $= \frac{7}{9}$, y–intercept $= 4$

A) $f(x) = \frac{7}{9}x - 4$ B) $f(x) = \frac{9}{7}x + \frac{36}{7}$ C) $f(x) = \frac{7}{9}x + 4$ D) $f(x) = -\frac{7}{9}x - 4$

5) Passing through (2, 2) and (4, 5)

A) $y - 2 = \frac{3}{2}(x - 2)$ B) $y = -\frac{3}{2}x - 1$ C) $y = mx - 1$ D) $y = \frac{3}{2}x - 1$

6) Passing through (8, 1) and (–1, –3)

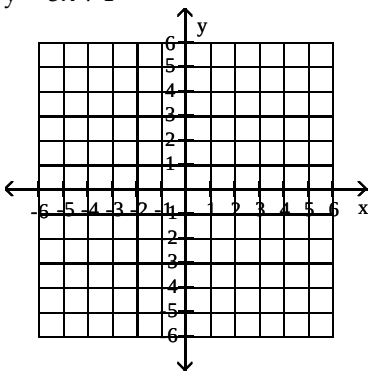
A) $y = mx - \frac{23}{9}$ B) $y - 1 = \frac{4}{9}(x - 8)$ C) $y = -\frac{4}{9}x - \frac{23}{9}$ D) $y = \frac{4}{9}x - \frac{23}{9}$

7) Passing through (–8, –7) and (–3, –8)

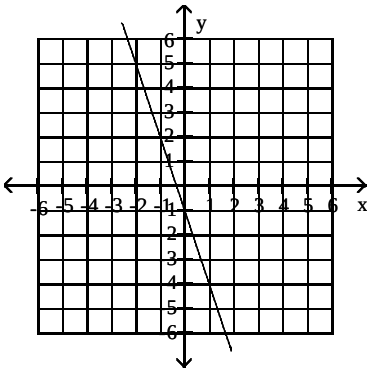
A) $y = \frac{1}{5}x - \frac{43}{5}$ B) $y + 7 = -\frac{1}{5}(x + 8)$ C) $y = mx - \frac{43}{5}$ D) $y = -\frac{1}{5}x - \frac{43}{5}$

Graph the line whose equation is given.

8) $y = 3x + 1$



A)



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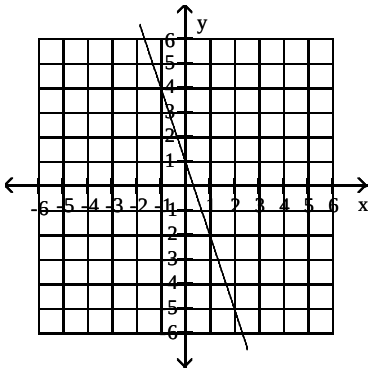

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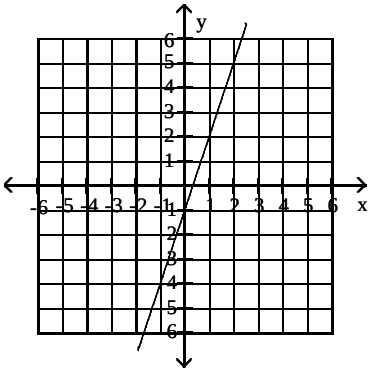

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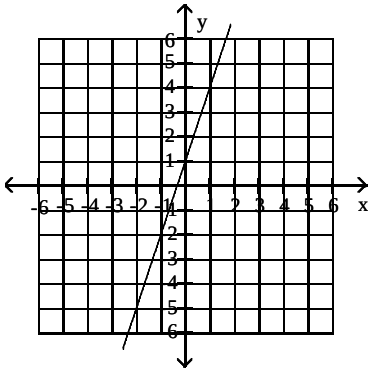
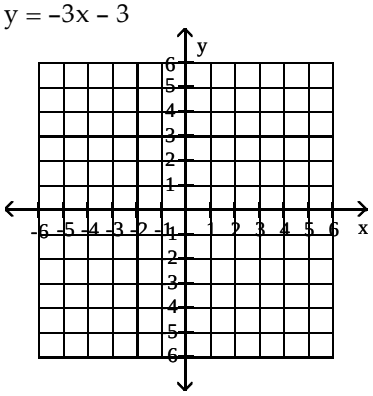
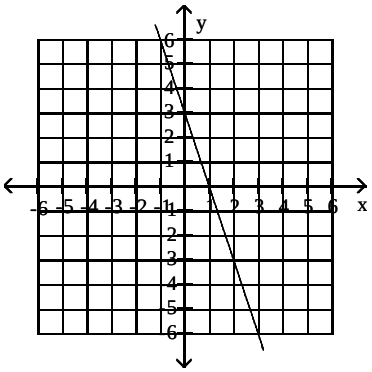


9) $y = -3x - 3$



A)



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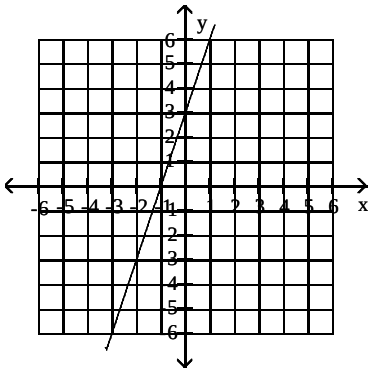

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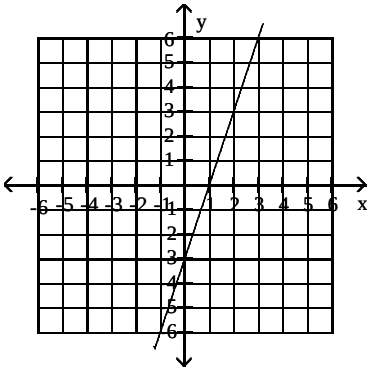

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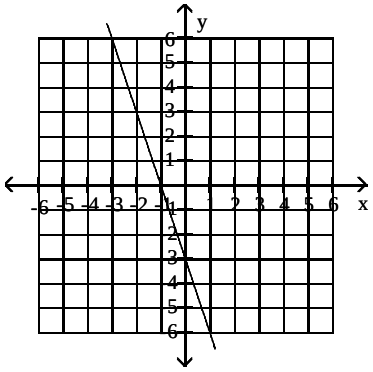
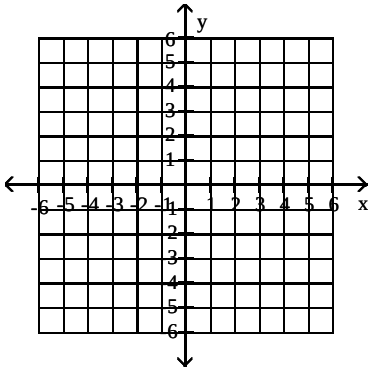
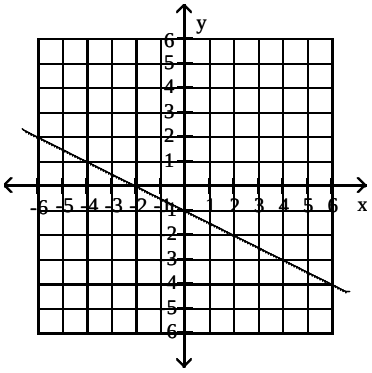


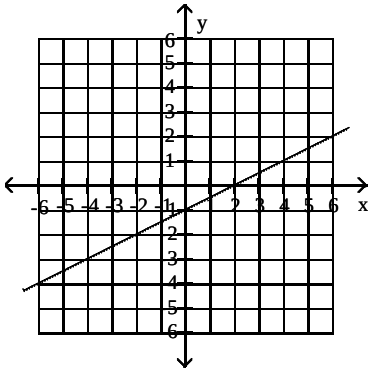
10) $y = \frac{1}{2}x - 1$



A)



B)



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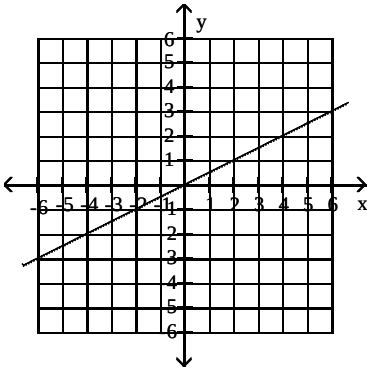
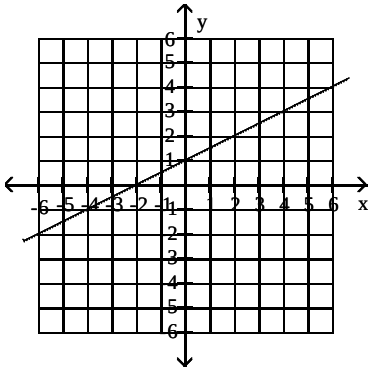
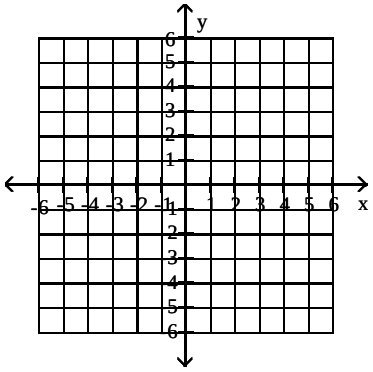


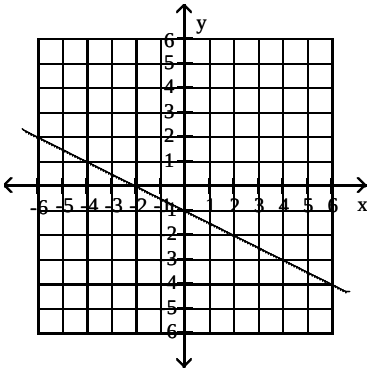
D)



11) $y = -\frac{1}{2}x - 1$



A)



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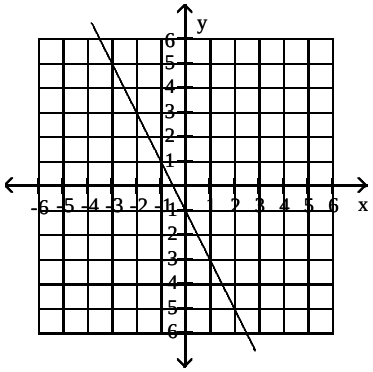

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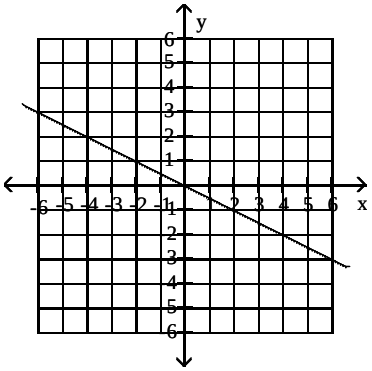

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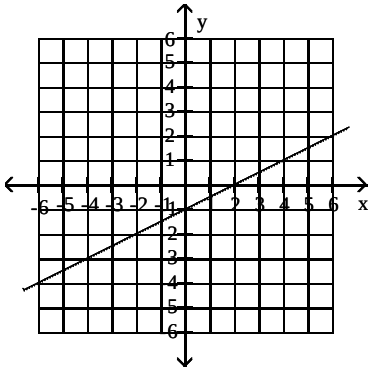
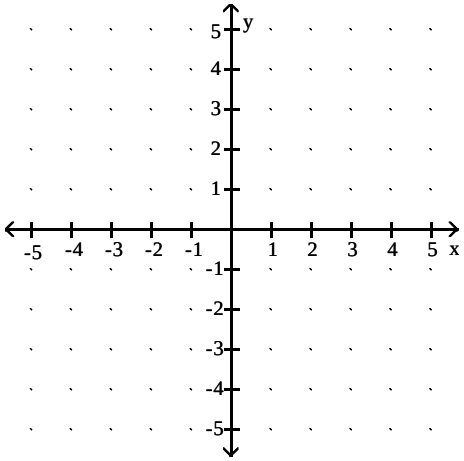


4 Graph Horizontal or Vertical Lines

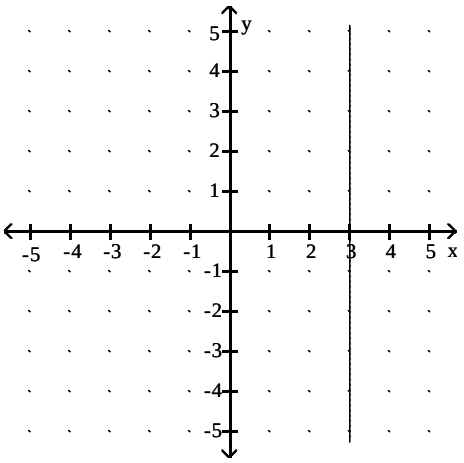
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph the equation in the rectangular coordinate system.

1) $x = 3$



A)



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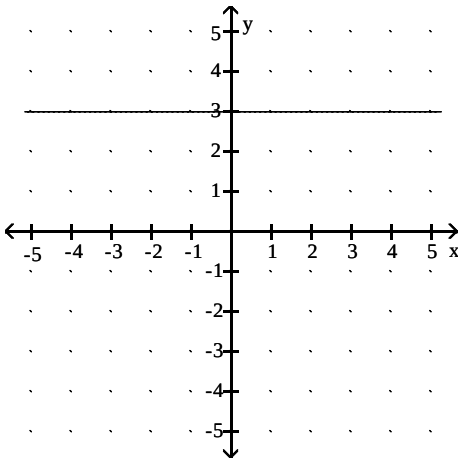

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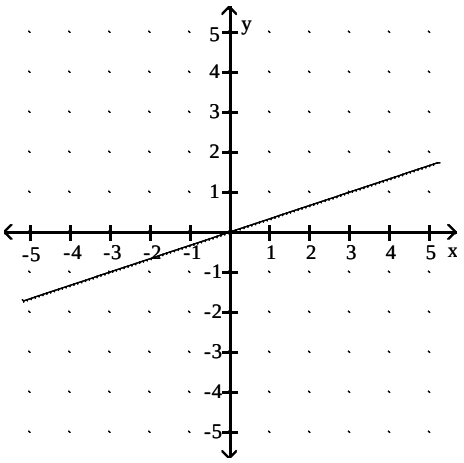
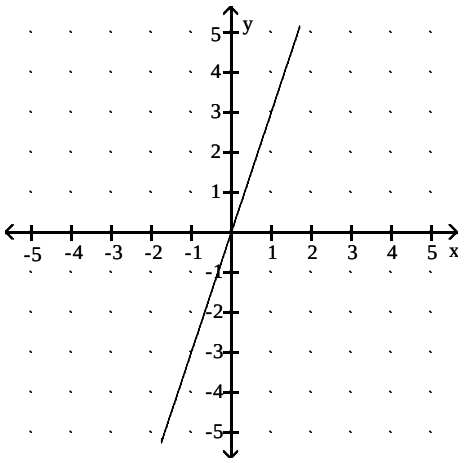
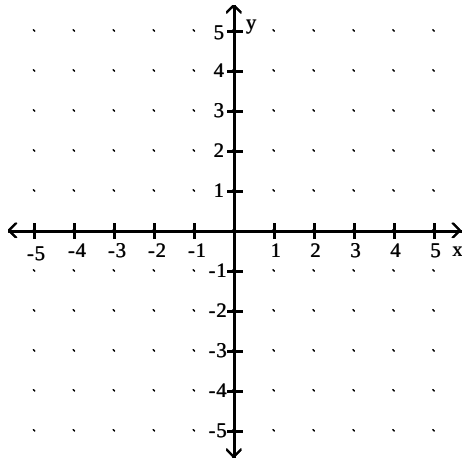


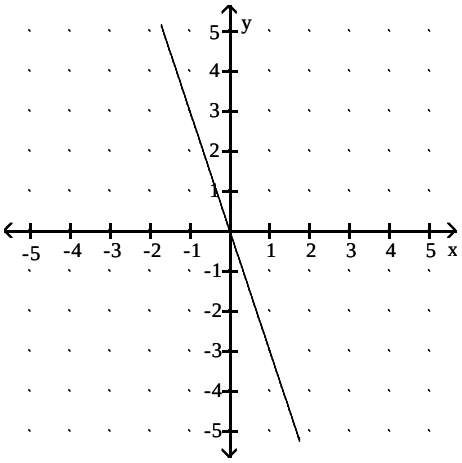
D)



2) $y = -3$



A)



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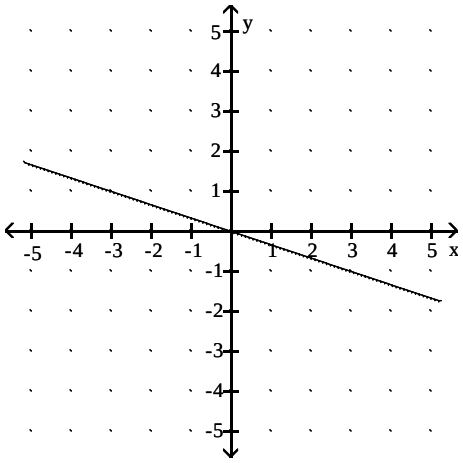

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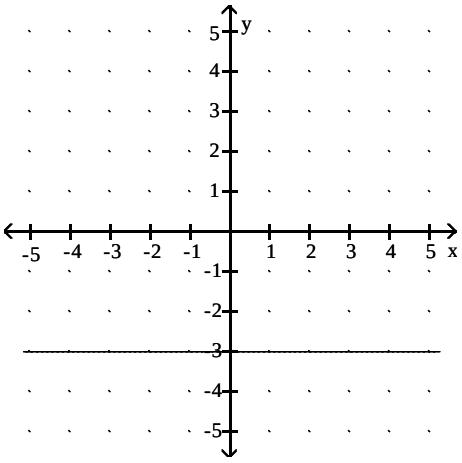

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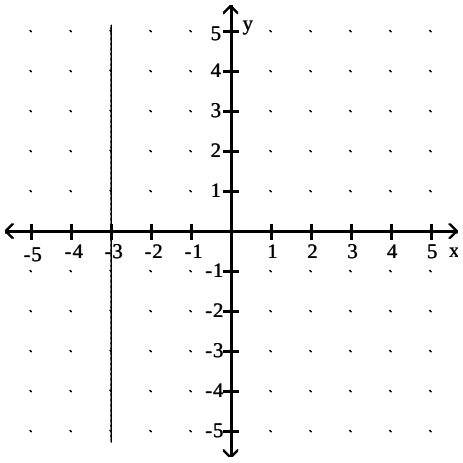
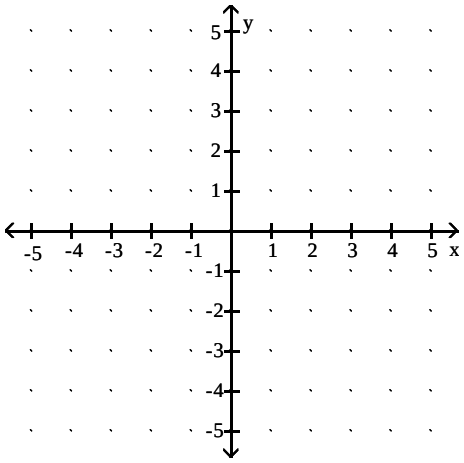
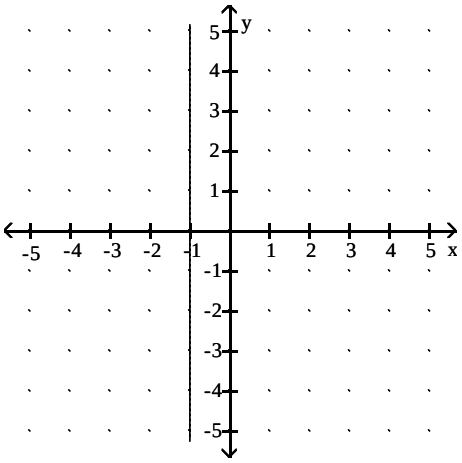


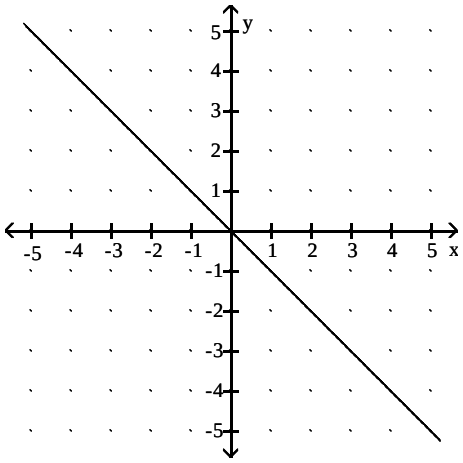
3) f(x) = –1



A)



B)



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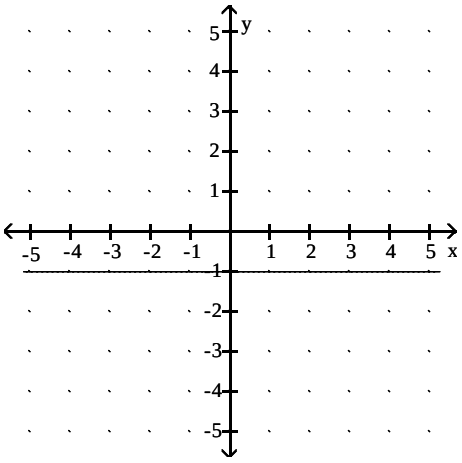

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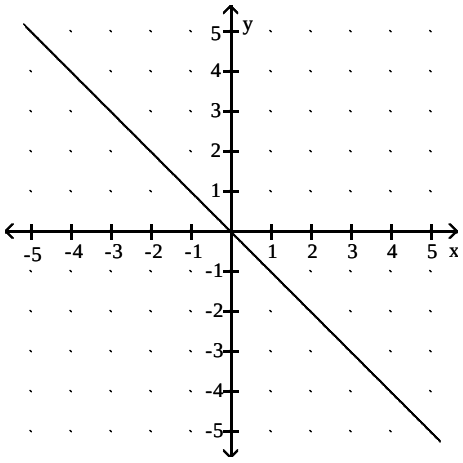
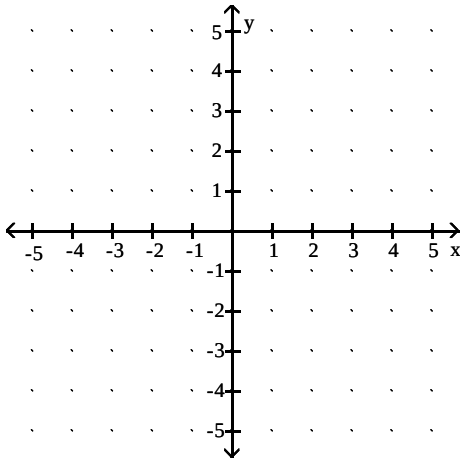
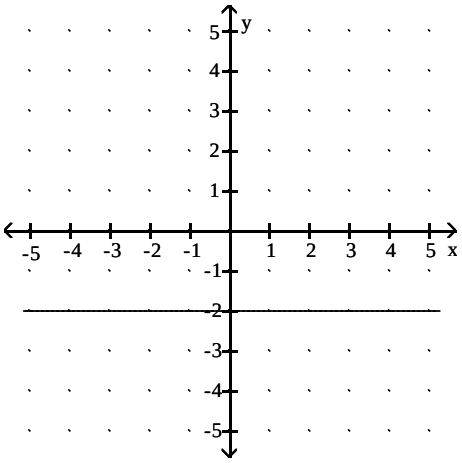


4) $4y = -8$



A)



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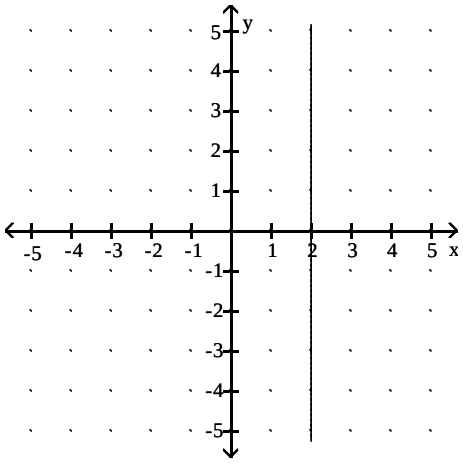

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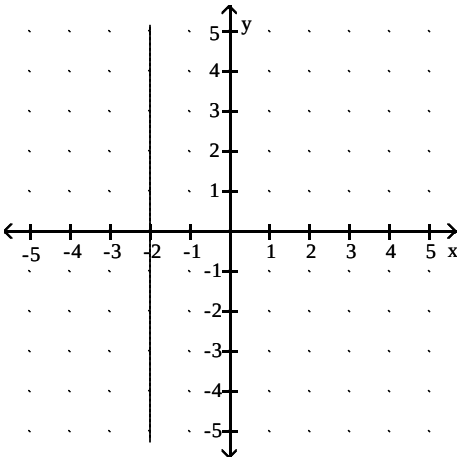

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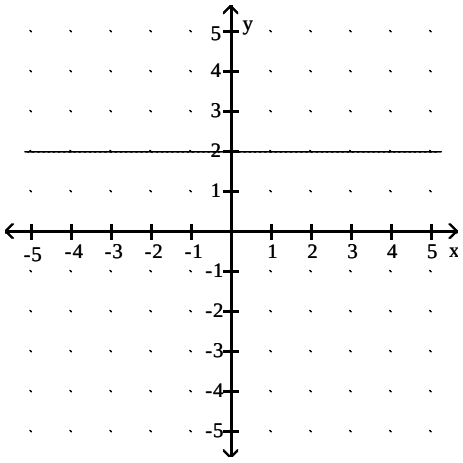
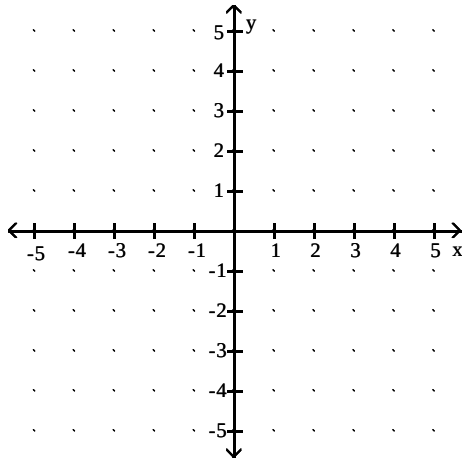
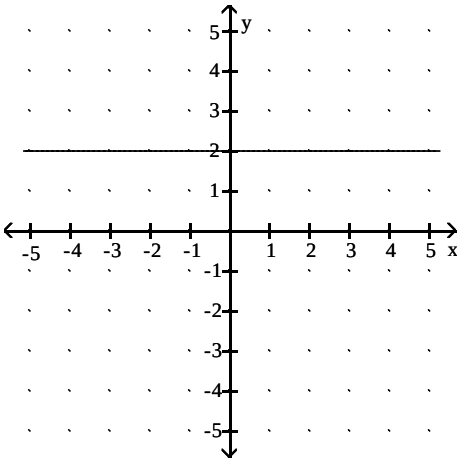


5) $4x = -8$



A)



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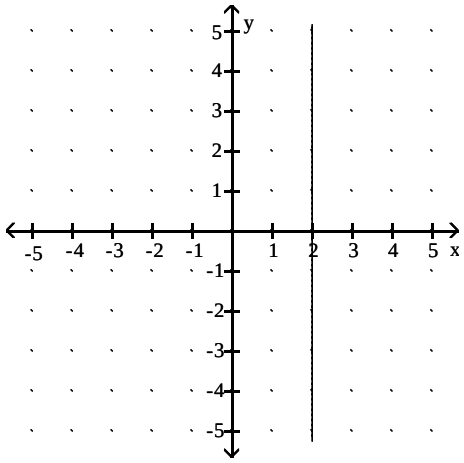

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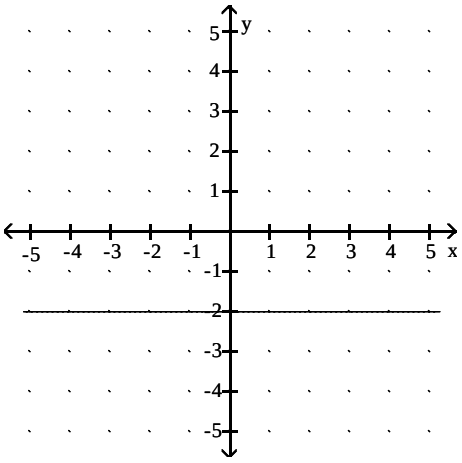

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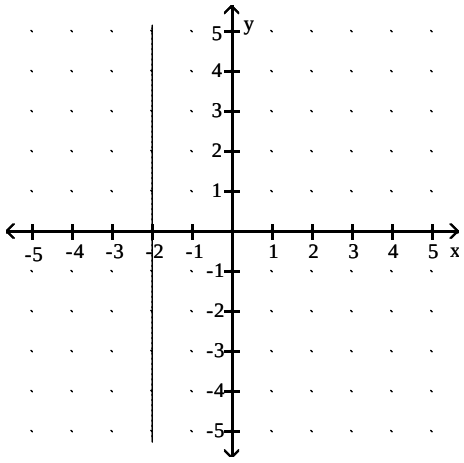
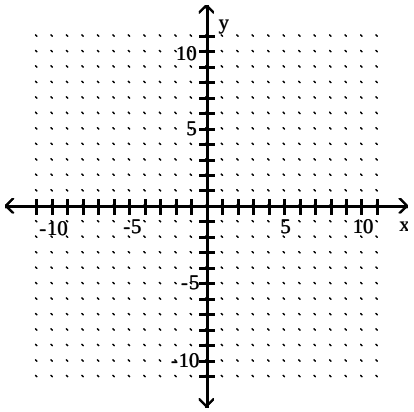
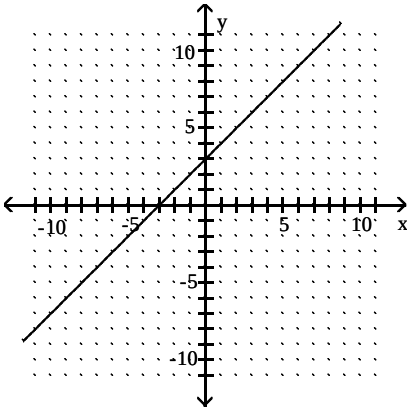


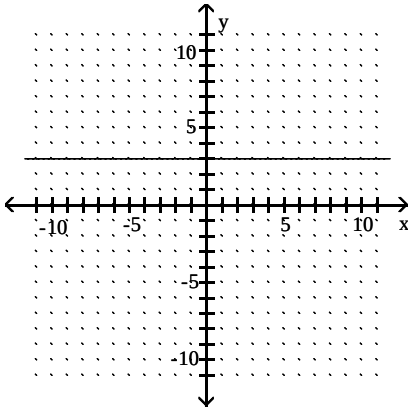
6) $6y = 18$


y
10
5
-10
-5
5
10
x
-5
-10

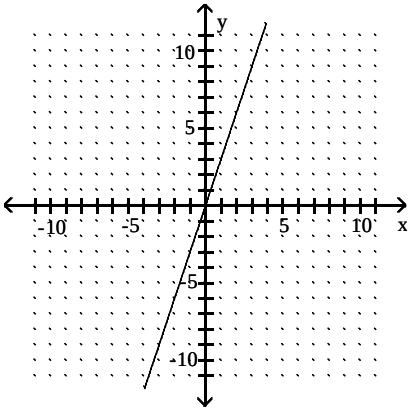
A)


y
10
5
-10
-5
5
10
x
-5
-10

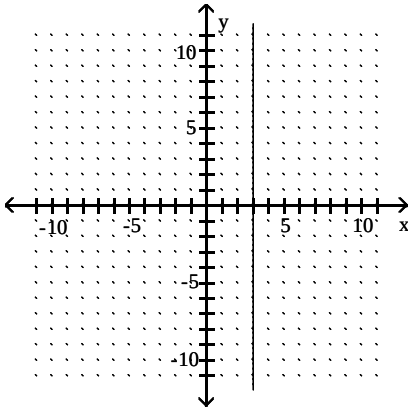
B)


y
10
5
-10
-5
5
10
x
-5
-10

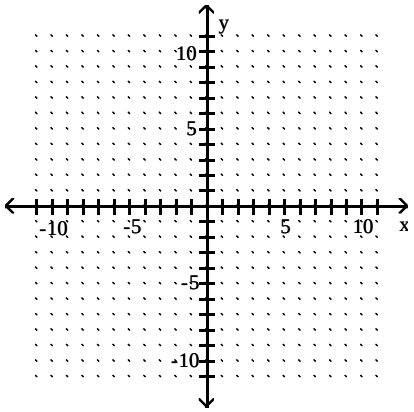
C)


y
10
5
-10
-5
5
10
x
-5
-10

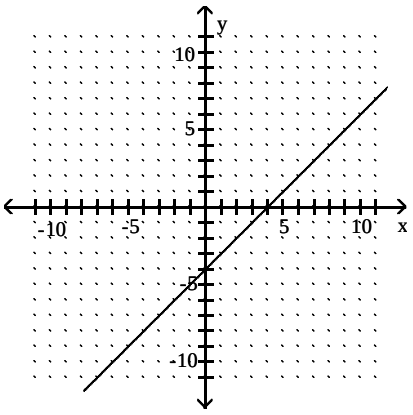
D)


y
10
5
-10
-5
5
10
x
-5
-10

7) $8x + 2 = -30$



A)



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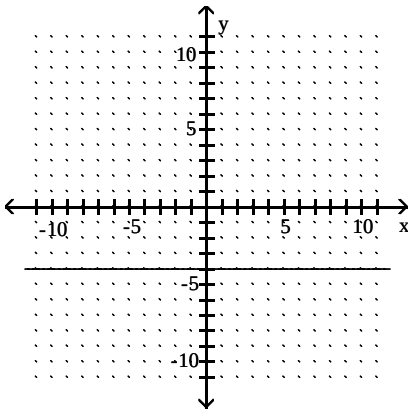
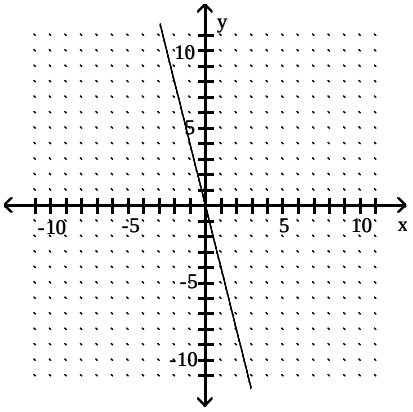
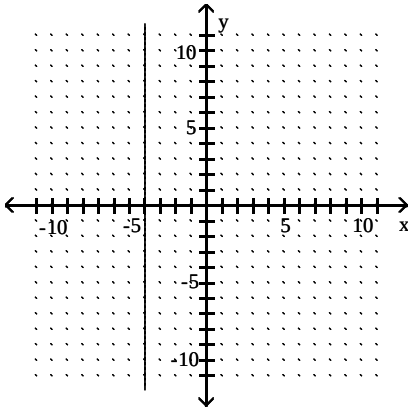


C)



D)



5 Recognize and Use the General Form of a Line's Equation

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine the slope and the y–intercept of the graph of the equation.

1) $y + 3 = 0$

A) m = 0; no y–intercept

B) m = 1; (0, –3)

C) m = –3; (0, 0)

D) m = 0; (0, –3)

2) $x + y + 8 = 0$

A) m = 0; (0, –8)

B) m = 1; (0, –8)

C) m = –1; (0, 8)

D) m = –1; (0, –8)

3) $8x + y - 7 = 0$

A) $m = \frac{8}{7}; \left(0, \frac{1}{7}\right)$ B) $m = 8; (0, 7)$ C) $m = -\frac{1}{8}; \left(0, \frac{7}{8}\right)$ D) $m = -8; (0, 7)$

4) $4x - 10y - 40 = 0$

A) $m = -\frac{2}{5}; (0, 4)$ B) $m = 4; (0, 40)$ C) $m = \frac{5}{2}; (0, 10)$ D) $m = \frac{2}{5}; (0, -4)$

5) $x + 2y - 1 = 0$

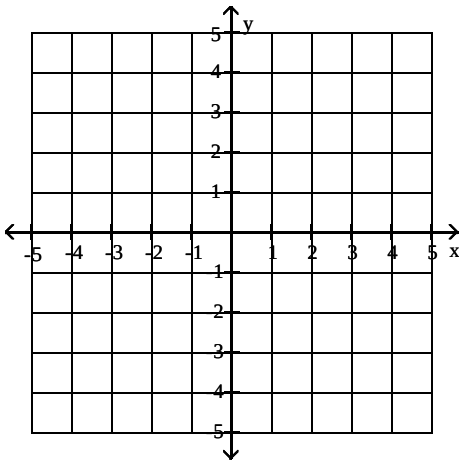
A) $m = -2; (0, 2)$ B) $m = \frac{1}{2}; \left(0, \frac{1}{2}\right)$ C) $m = 1; (0, 1)$ D) $m = -\frac{1}{2}; \left(0, \frac{1}{2}\right)$

6) $-x + 10y - 40 = 0$

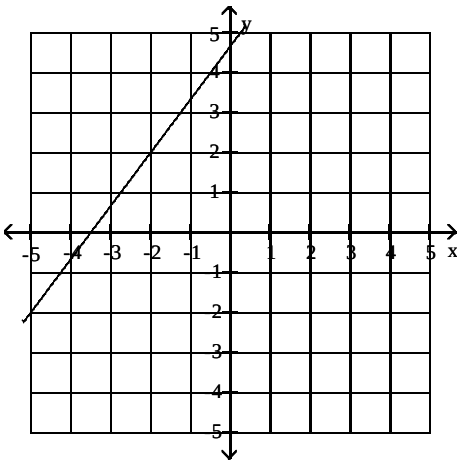
A) $m = 10; (0, -40)$ B) $m = -\frac{1}{10}; (0, 4)$ C) $m = -1; (0, 40)$ D) $m = \frac{1}{10}; (0, 4)$

Graph the equation.

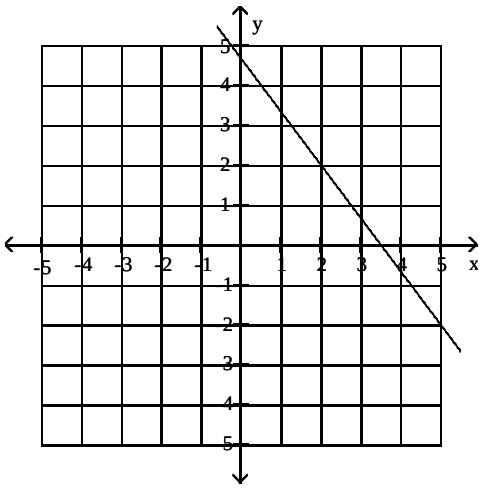
7) $3x + 4y - 14 = 0$



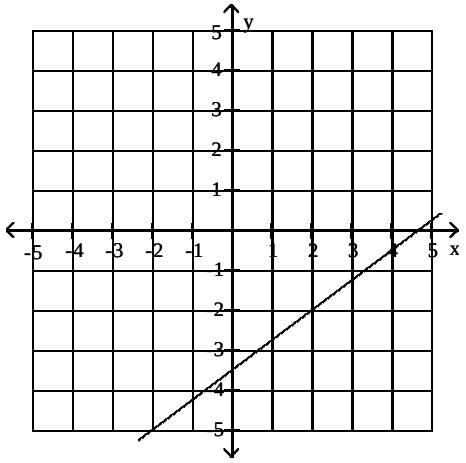
A)



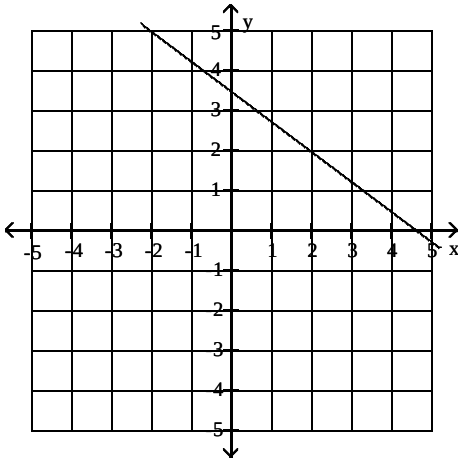
B)



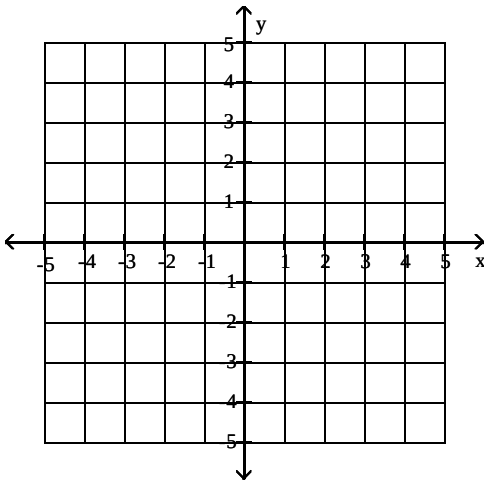
C)



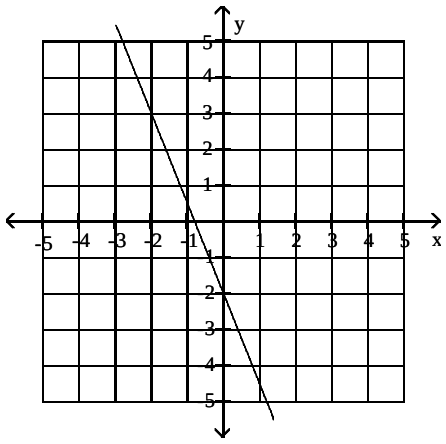
D)



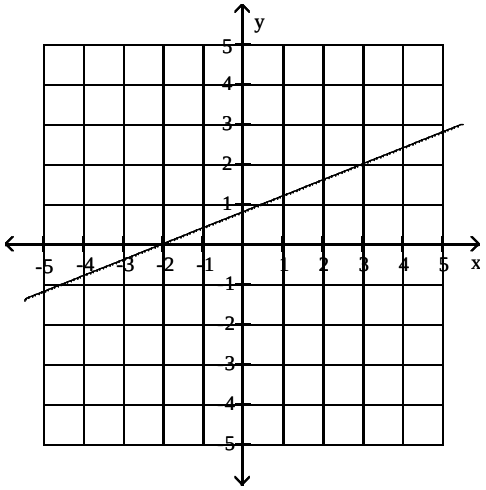
8) $2x - 5y + 4 = 0$



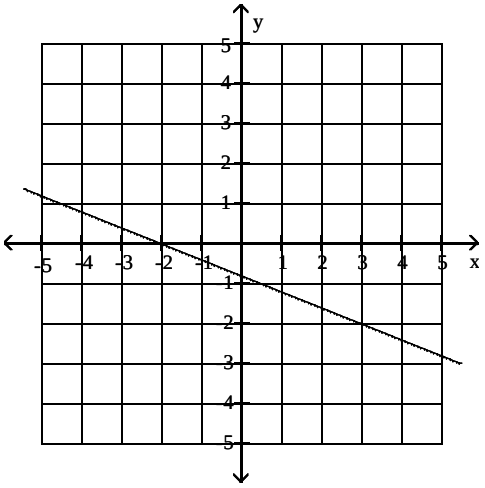
A)



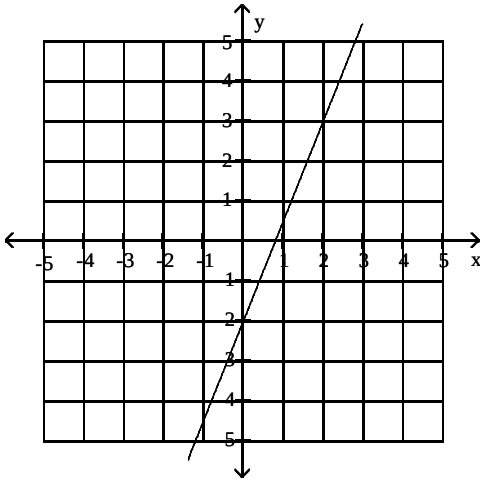
B)



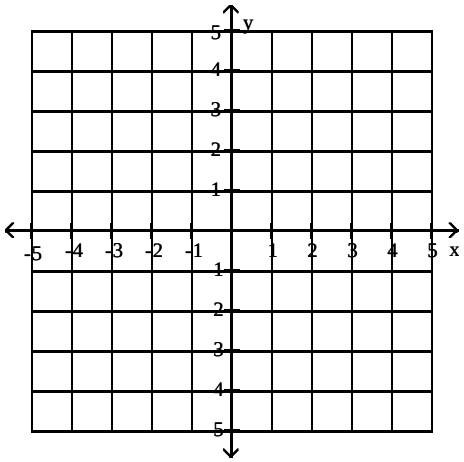
C)



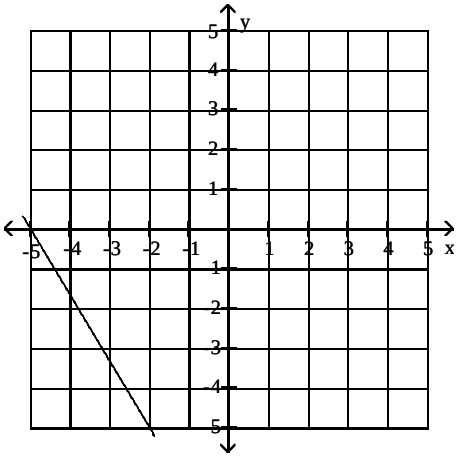
D)



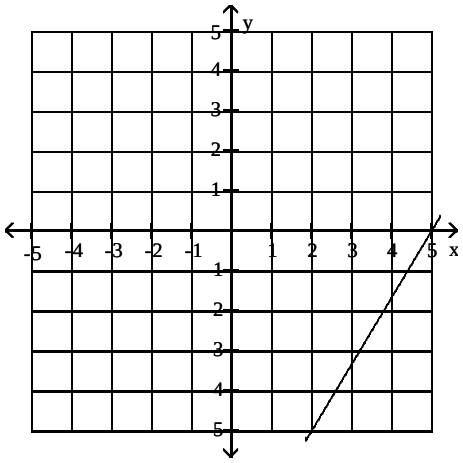
9) $3x - 5y + 25 = 0$



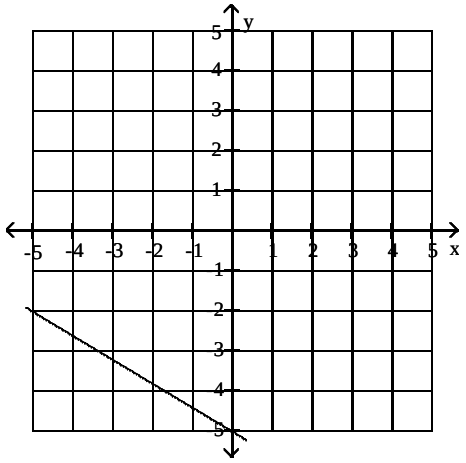
A)



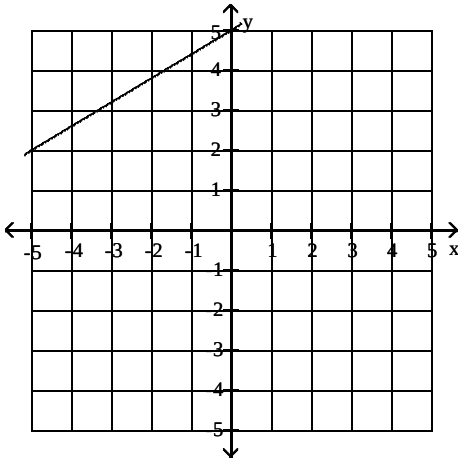
B)



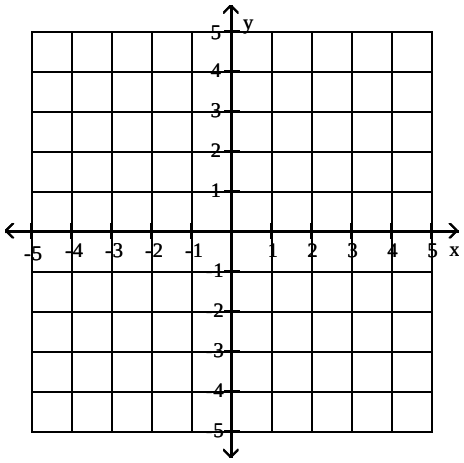
C)



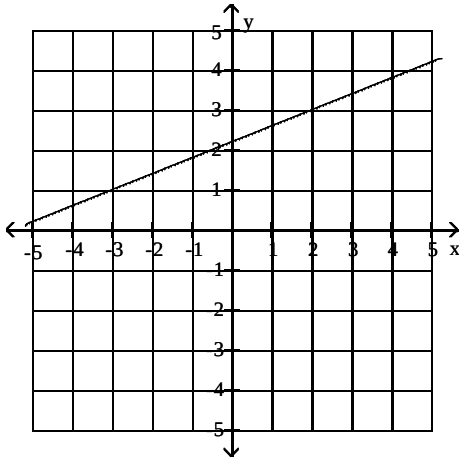
D)



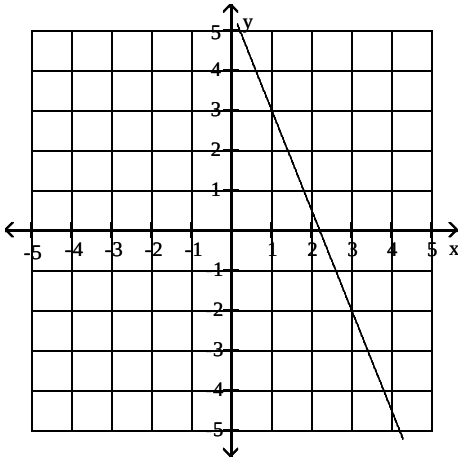
10) $-5y + 2x + 11 = 0$



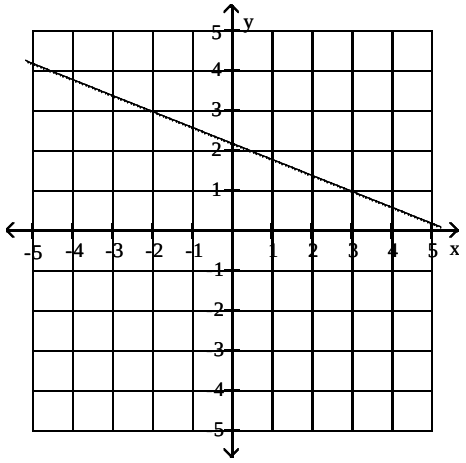
A)



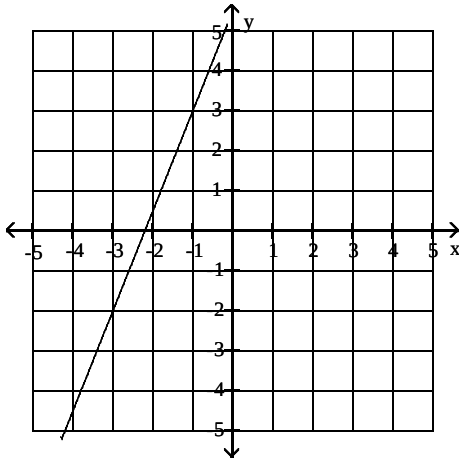
B)



C)



D)

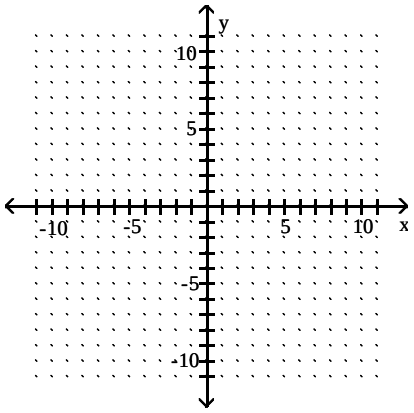


6 Use Intercepts to Graph the General Form of a Line's Equation

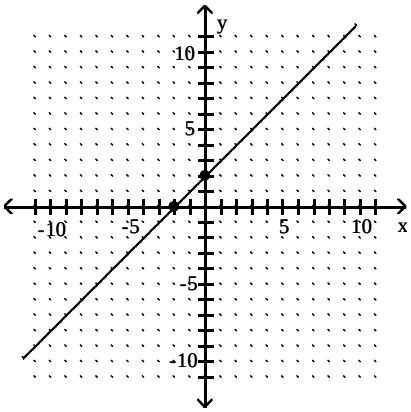
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph the linear function by plotting the x– and y–intercepts.

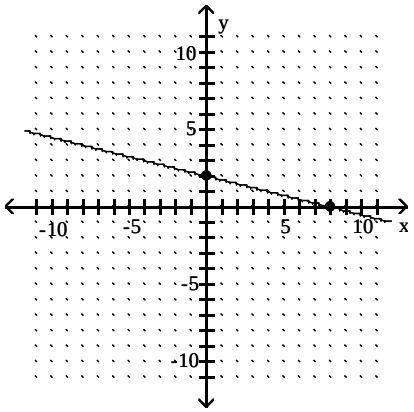
1) $-\frac{1}{4}x + y - 2 = 0$



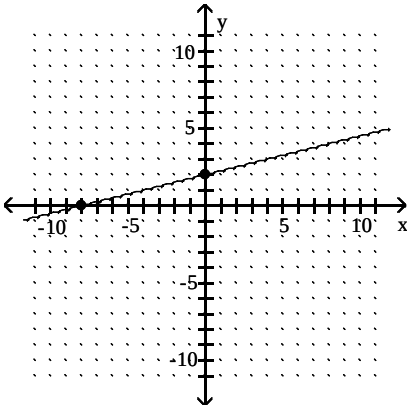
A) intercepts: (0, 2), (–2, 0)



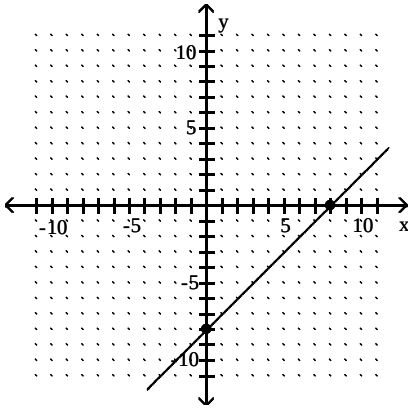
B) intercepts: (0, 2), (8, 0)



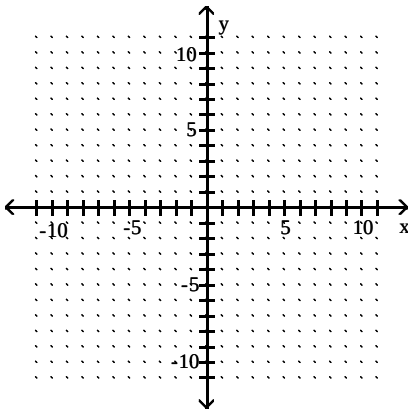
C) intercepts: (0, 2), (–8, 0)



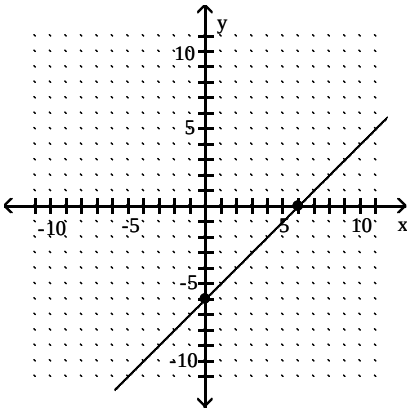
D) intercepts: (0, –8), (8, 0)



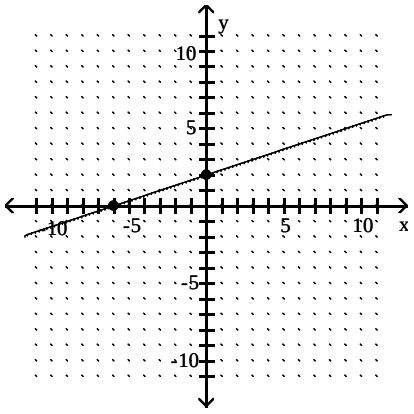
2) $\frac{1}{3}x + y - 2 = 0$



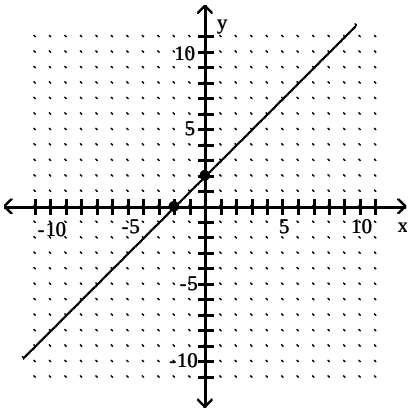
A) intercepts: (0, –6), (6, 0)



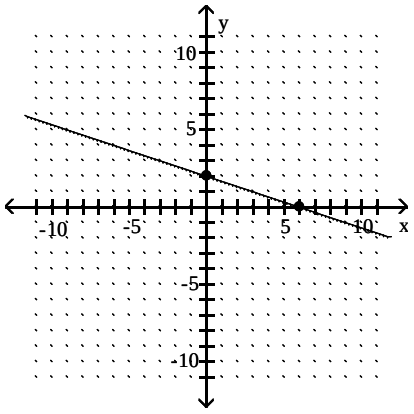
B) intercepts: (0, 2), (–6, 0)



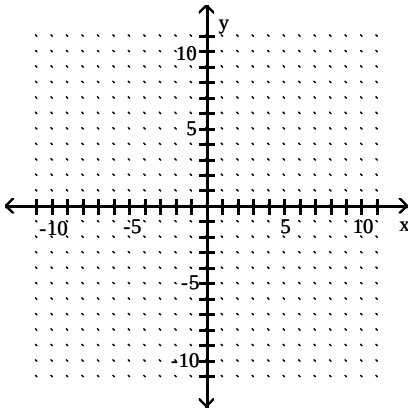
C) intercepts: (0, 2), (–2, 0)



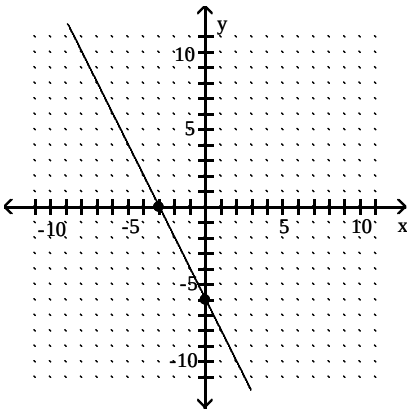
D) intercepts: (0, 2), (6, 0)



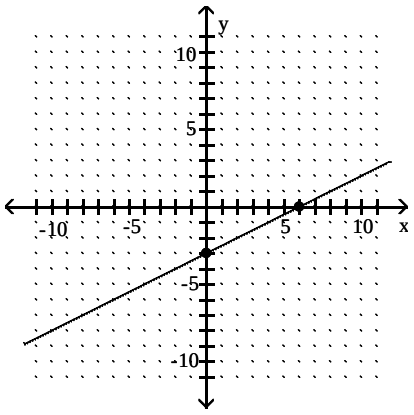
3) $-4x - 8y - 24 = 0$



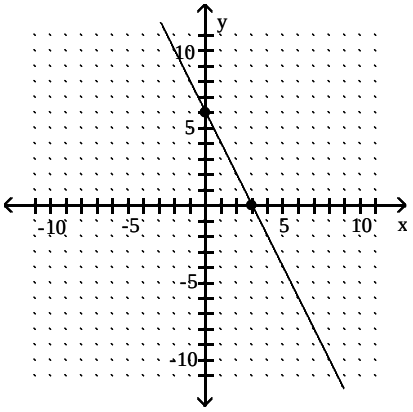
A) intercepts: (0, –6), (–3, 0)



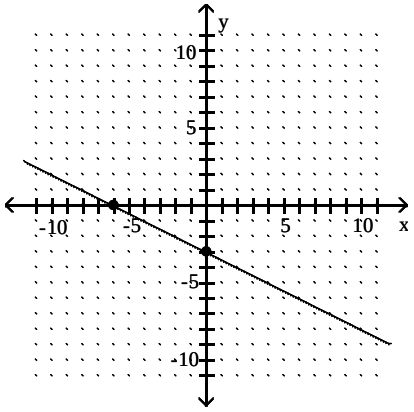
B) intercepts: (0, –3), (6, 0)



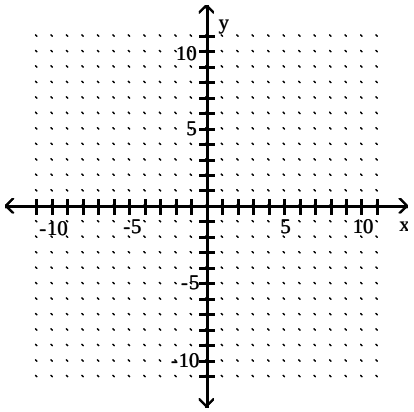
C) intercepts: (0, 6), (3, 0)



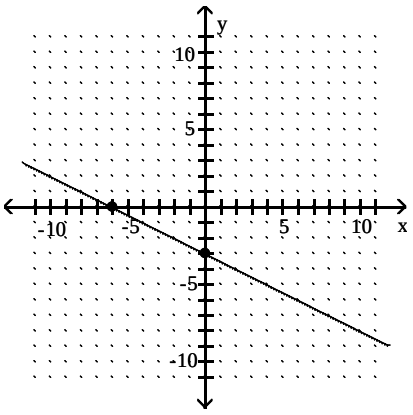
D) intercepts: (0, –3), (–6, 0)



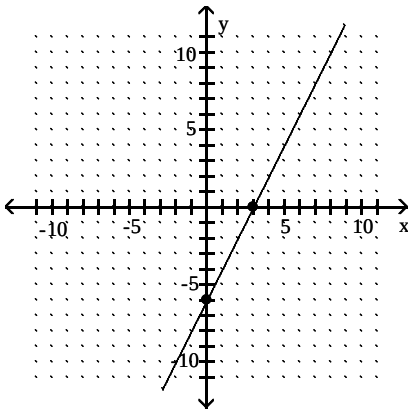
4) $4x - 8y - 24 = 0$



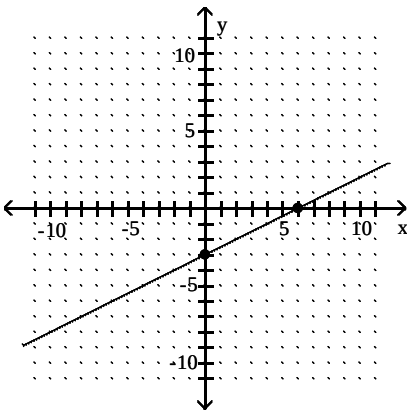
A) intercepts: (0, –3), (–6, 0)



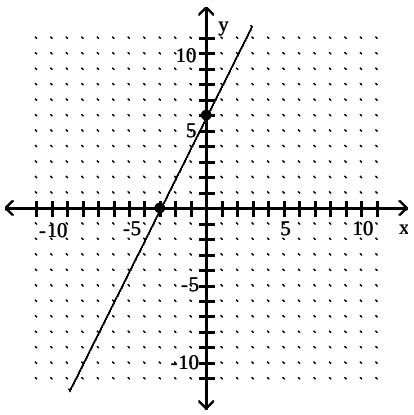
B) intercepts: (0, –6), (3, 0)



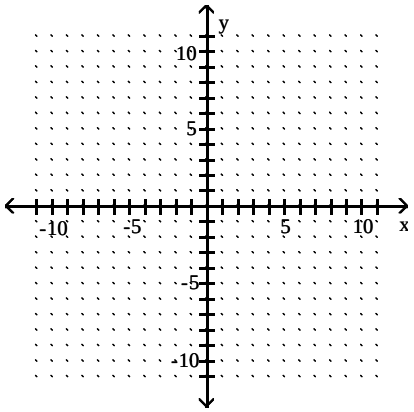
C) intercepts: (0, –3), (6, 0)



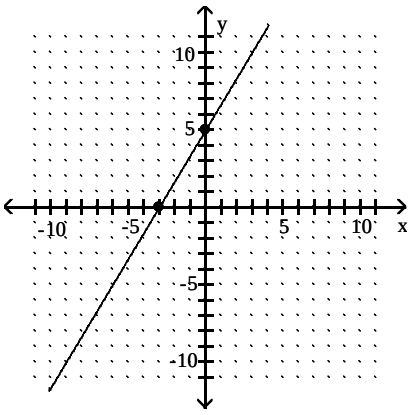
D) intercepts: (0, 6), (–3, 0)



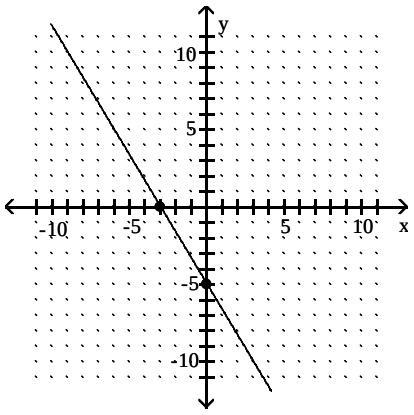
5) $50x - 30y - 150 = 0$



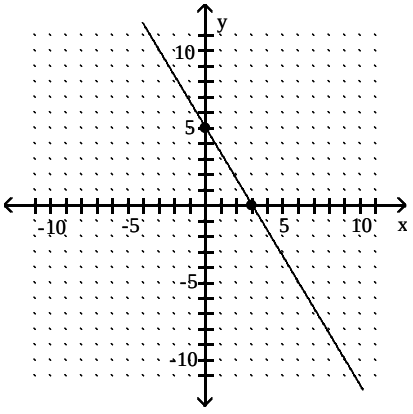
A) intercepts: (0, 5), (–3, 0)



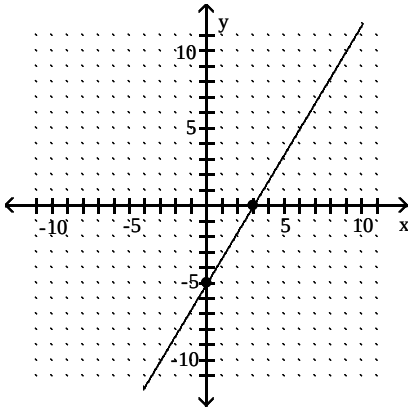
B) intercepts: (0, –5), (–3, 0)



C) intercepts: (0, 5), (3, 0)



D) intercepts: (0, –5), (3, 0)

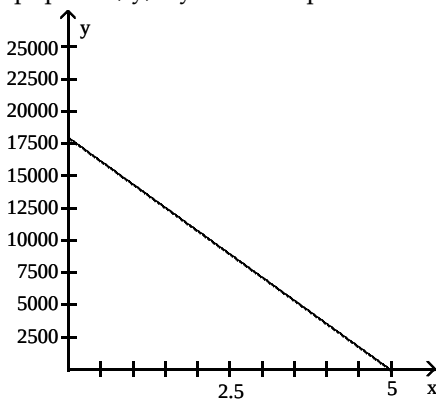


7 Model Data with Linear Functions and Make Predictions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve.

1) A school has just purchased new computer equipment for $18,000.00. The graph shows the depreciation of the equipment over 5 years. The point (0, 18,000) represents the purchase price and the point (5, 0) represents when the equipment will be replaced. Write a linear equation in slope–intercept form that models the value of the equipment, y, x years after purchase. Use the model to predict the value of the equipment after 2 years.



A) y = 18,000x + 5;
value after 2 years is $10,800.00

B) y = – 3600x + 18,000;
value after 2 years is $10,800.00;

C) y = 3600x – 18,000;
value after 2 years is $10,800.00

D) y = – 18,000x + 18,000;
value after 2 years is $–18,000.00

2) The average value of a certain type of automobile was $14,880 in 1994 and depreciated to $4440 in 1999. Let y be the average value of the automobile in the year x, where x = 0 represents 1994. Write a linear equation that models the value of the automobile in terms of the year x.

A) $y = -\frac{1}{2088}x - 4440$

B) y = –2088x + 14,880

C) y = –2088x – 6000

D) y = –2088x + 4440

3) An investment is worth $2189 in 1991. By 1996 it has grown to $4354. Let y be the value of the investment in the year x, where x = 0 represents 1991. Write a linear equation that models the value of the investment in the year x.

A) y = 433x + 2189

B) $y = \frac{1}{433}x + 2189$

C) y = –433x + 2189

D) y = –433x + 6519

4) A faucet is used to add water to a large bottle that already contained some water. After it has been filling for 3 seconds, the gauge on the bottle indicates that it contains 9 ounces of water. After it has been filling for 10 seconds, the gauge indicates the bottle contains 23 ounces of water. Let y be the amount of water in the bottle x seconds after the faucet was turned on. Write a linear equation that models the amount of water in the bottle in terms of x.

A) $y = \frac{1}{2}x + \frac{15}{2}$

B) y = 2x + 3

C) y = 2x + 13

D) y = –2x + 15

5) When making a telephone call using a calling card, a call lasting 3 minutes cost \$1.20. A call lasting 11 minutes cost \$3.20. Let y be the cost of making a call lasting x minutes using a calling card. Write a linear equation that models the cost of a making a call lasting x minutes.

A) $y = 0.25x - 7.8$ B) $y = -0.25x + 1.95$ C) $y = 0.25x + 0.45$ D) $y = 4x - \frac{54}{5}$

6) A vendor has learned that, by pricing carmel apples at \$1.00, sales will reach 123 carmel apples per day. Raising the price to \$1.50 will cause the sales to fall to 103 carmel apples per day. Let y be the number of carmel apples the vendor sells at x dollars each. Write a linear equation that models the number of carmel apples sold per day when the price is x dollars each.

A) $y = 40x + 83$ B) $y = -40x - 163$ C) $y = -40x + 163$ D) $y = -\frac{1}{40}x + \frac{4919}{40}$

7) The average value of a certain type of automobile was \$15,180 in 1993 and depreciated to \$5880 in 1996. Let y be the average value of the automobile in the year x, where $x = 0$ represents 1993. Write a linear equation that models the value of the automobile in terms of the year x.

A) $y = -\frac{1}{3100}x - 5880$ B) $y = -3100x + 5880$

C) $y = -3100x + 15{,}180$ D) $y = -3100x - 3420$

8) An investment is worth \$2186 in 1991. By 1996 it has grown to \$3646. Let y be the value of the investment in the year x, where $x = 0$ represents 1991. Write a linear equation that models the value of the investment in the year x.

A) $y = -292x + 5106$ B) $y = \frac{1}{292}x + 2186$ C) $y = -292x + 2186$ D) $y = 292x + 2186$

9) When making a telephone call using a calling card, a call lasting 5 minutes cost \$0.85. A call lasting 14 minutes cost \$1.75. Let y be the cost of making a call lasting x minutes using a calling card. Write a linear equation that models the cost of making a call lasting x minutes.

A) $y = 0.1x - 12.25$ B) $y = 10x - \frac{983}{20}$ C) $y = 0.1x + 0.35$ D) $y = -0.1x + 1.35$

10) A vendor has learned that, by pricing pretzels at \$1.50, sales will reach 99 pretzels per day. Raising the price to \$2.50 will cause the sales to fall to 59 pretzels per day. Let y be the number of pretzels the vendor sells at x dollars each. Write a linear equation that models the number of pretzels sold per day when the price is x dollars each.

A) $y = 40x + 39$ B) $y = -40x + 159$ C) $y = -\frac{1}{40}x + \frac{7917}{80}$ D) $y = -40x - 159$

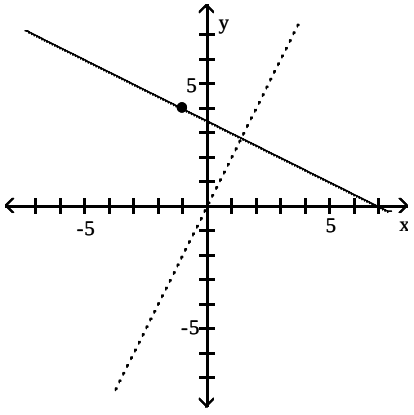
1.5 More on Slope

1 Find Slopes and Equations of Parallel and Perpendicular Lines

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

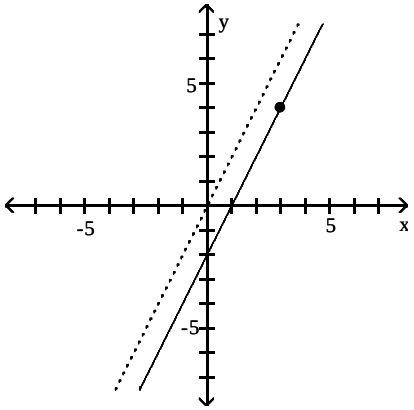
Find an equation for the line with the given properties.

1) The solid line L contains the point (–1, 4) and is perpendicular to the dotted line whose equation is y = 2x. Give the equation of line L in slope–intercept form.



A) $y = \frac{1}{2}x + \frac{7}{2}$ B) $y = -\frac{1}{2}x + \frac{7}{2}$ C) $y - 4 = 2(x + 1)$ D) $y - 4 = -\frac{1}{2}(x + 1)$

2) The solid line L contains the point (3, 4) and is parallel to the dotted line whose equation is y = 2x. Give the equation for the line L in slope–intercept form.



A) y = 2x + b B) y = 2x – 2 C) y – 4 = 2(x – 3) D) y = 2x + 1

Use the given conditions to write an equation for the line in the indicated form.

3) Passing through (5, 4) and parallel to the line whose equation is y = 2x – 6; point–slope form

A) y – 4 = 2(x – 5) B) y = 2x C) y – 5 = 2(x – 4) D) y – 4 = x – 5

4) Passing through (4, 4) and perpendicular to the line whose equation is y = 4x + 7; point–slope form

A) $y - 4 = \frac{1}{4}(x + 4)$ B) $y - 4 = \frac{1}{4}(x - 4)$ C) $y - 4 = -\frac{1}{4}(x - 4)$ D) y = – 4x – 20

5) Passing through (3, 1) and parallel to the line whose equation is $y = -2x + 3$; point–slope form

A) $y - 1 = -2(x - 3)$ B) $y = 2x$ C) $y - 3 = -2(x - 1)$ D) $y - 1 = x - 3$

6) Passing through (2, –4) and parallel to the line whose equation is $y = -4x + 9$; slope–intercept form

A) $y = -4x - 4$ B) $y = 4x - 4$ C) $y = -\frac{1}{4}x - 1$ D) $y = -4x + 4$

7) Passing through (2, 5) and perpendicular to the line whose equation is $y = \frac{1}{8}x + 5$;

slope–intercept form

A) $y = -8x - 21$ B) $y = 8x - 21$ C) $y = -\frac{1}{8}x - \frac{21}{8}$ D) $y = -8x + 21$

8) Passing through (4, 4) and parallel to the line whose equation is $y = -\frac{1}{7}x + 7$;

slope–intercept form

A) $y = -7x - 32$ B) $y = -\frac{1}{7}x + \frac{32}{7}$ C) $y = \frac{1}{7}x - \frac{32}{7}$ D) $y = -\frac{1}{7}x - \frac{32}{7}$

9) Passing through (2, 2) and parallel to the line whose equation is $5x + y - 8 = 0$; slope–intercept form

A) $y = -\frac{1}{5}x - \frac{12}{5}$ B) $y = -5x - 12$ C) $y = -5x + 12$ D) $y = 5x - 12$

10) Passing through (2, 2) and perpendicular to the line whose equation is $-9x + y - 9 = 0$; slope–intercept form

A) $y = \frac{1}{9}x - \frac{20}{9}$ B) $y = -9x - 20$ C) $y = -\frac{1}{9}x - \frac{20}{9}$ D) $y = -\frac{1}{9}x + \frac{20}{9}$

2 Interpret Slope as Rate of Change

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the slope then describe what it means in terms of the rate of change of the dependent variable per unit change in the independent variable.

1) The linear function $f(x) = 4.8x + 30$ represents the percentage of people, f(x), who graduated from college x years after 1998.

A) m = 4.8; the percentage of people graduating from college has decreased at a rate of 4.8% per year after 1998.

B) m = 4.8; the percentage of people graduating from college has increased at a rate of 4.8% per year after 1998.

C) m = –4.8; the percentage of people graduating from college has decreased at a rate of 4.8% per year after 1998.

D) m = 30; the percentage of people graduating from college has increased at a rate of 30% per year after 1998.

2) The linear function f(x) = –5.1x + 35 models the percentage of people, f(x), who eat at fast food restaurants each week x years after 1998.

A) m = –5.1; the percentage of people eating at fast food restaurants each week has decreased at a rate of –5.1% per year after 1998.

B) m = 35; the percentage of people eating at fast food restaurants each week has increased at a rate of –5.1% per year after 1998.

C) m = 5.1; the percentage of people eating at fast food restaurants each week has increased at a rate of 5.1% per year after 1998.

D) m = 5.1; the percentage of people eating at fast food restaurants each week has increased at a rate of –5.1% per year after 1998.

3 Find a Function's Average Rate of Change

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the average rate of change of the function from x_1 to x_2.

1) $f(x) = \sqrt{2x}$ from $x_1 = 2$ to $x_2 = 8$

A) 7 B) $-\frac{3}{10}$ C) 2 D) $\frac{1}{3}$

2) $f(x) = -3x^2 - x$ from $x_1 = 5$ to $x_2 = 6$

A) –2 B) $-\frac{1}{6}$ C) –34 D) $\frac{1}{2}$

3) $f(x) = 5x + 7$ from $x_1 = -1$ to $x_2 = 0$

A) $-\frac{1}{6}$ B) $\frac{1}{2}$ C) –28 D) 5

Solve the problem.

4) From April through December 2000, the stock price of QRS Company had a roller coaster ride. The chart below indicates the price of the stock at the beginning of each month during that period. Find the monthly average rate of change in price between June and September.

Month	Price
April (x = 1)	116
May	108
June	88
July	100
August	96
September	113
October	91
November	86
December	65

A) $12.50 per month B) –$8.33 per month C) $8.33 per month D) –$12.50 per month

5) Along with incomes, people's charitable contributions have steadily increased over the past few years. The table below shows the average deduction for charitable contributions reported on individual income tax returns for the period 1993 to 1998. Find the average annual increase between 1995 and 1997.

Year	Charitable Contributions
1993	$1640
1994	$2380
1995	$2450
1996	$2800
1997	$3030
1998	$3160

A) $580 per year B) $290 per year C) $325 per year D) $355 per year

6) A deep sea diving bell is being lowered at a constant rate. After 10 minutes, the bell is at a depth of 300 ft. After 40 minutes the bell is at a depth of 1600 ft. What is the average rate of lowering per minute? Round to the nearest hundredth is needed.

A) 32.5 ft per minute B) 0.02 ft per minute C) 43.3 ft per minute D) 40.0 ft per minute

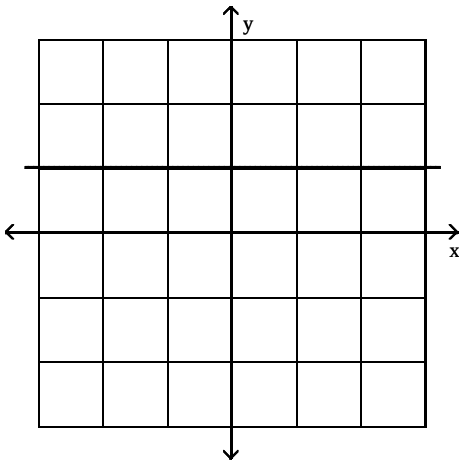
1.6 Transformations of Functions

1 Recognize Graphs of Common Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the shape of the graph to name the function.

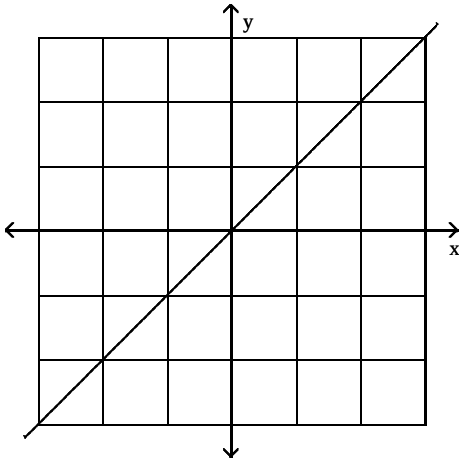
1)



A) Absolute value function B) Identity function

C) Standard cubic function D) Constant function

2)



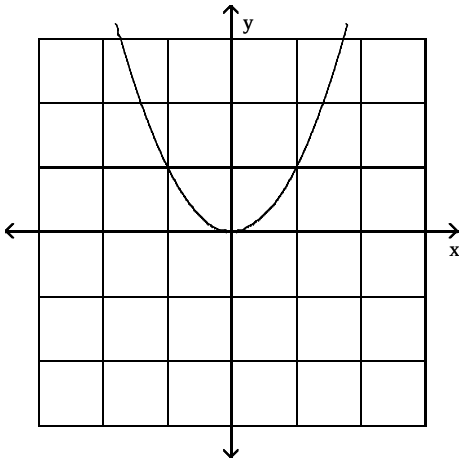
A) Absolute value function

B) Square root function

C) Identity function

D) Constant function

3)



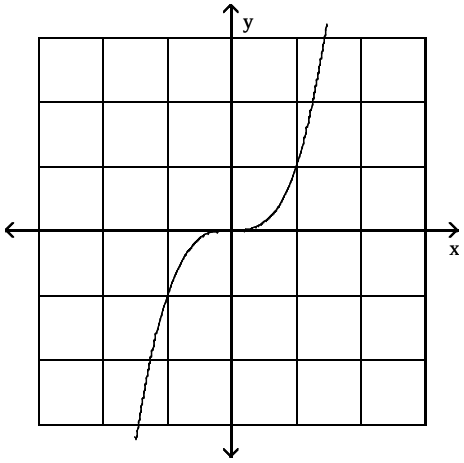
A) Square root function

B) Standard cubic function

C) Constant function

D) Standard quadratic function

4)



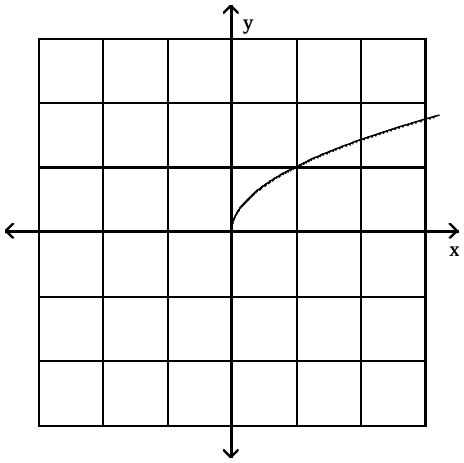
A) Square root function

B) Constant function

C) Standard cubic function

D) Standard quadratic function

5)



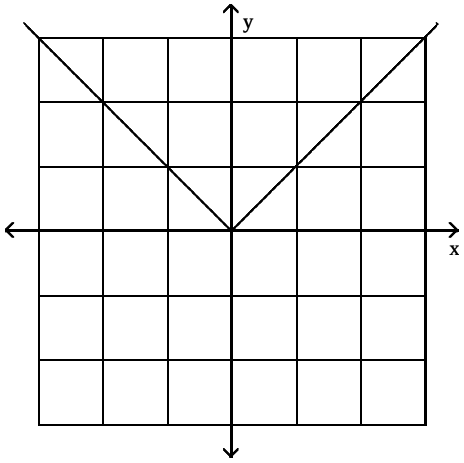
A) Standard quadratic function

B) Constant function

C) Standard cubic function

D) Square root function

6)



A) Constant function

B) Standard cubic function

C) Absolute value function

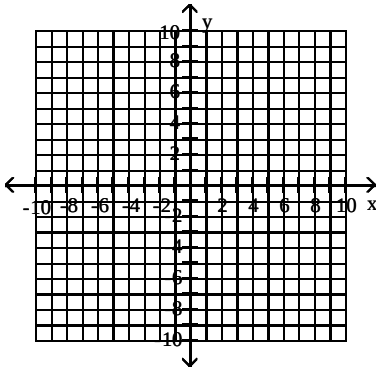
D) Identity function

2 Use Vertical Shifts to Graph Functions

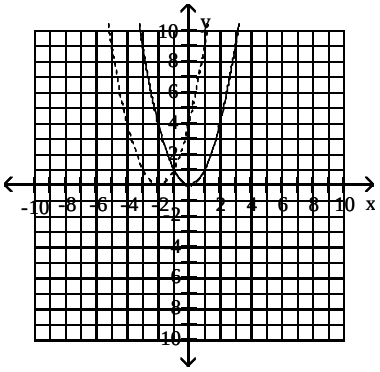
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

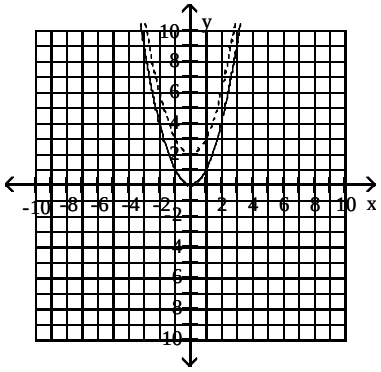
1) $g(x) = x^2 + 2$



A)



B)



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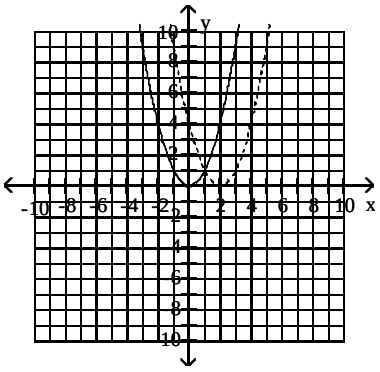
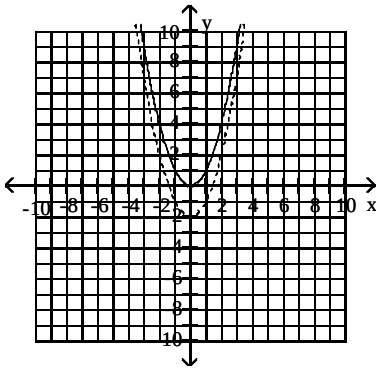
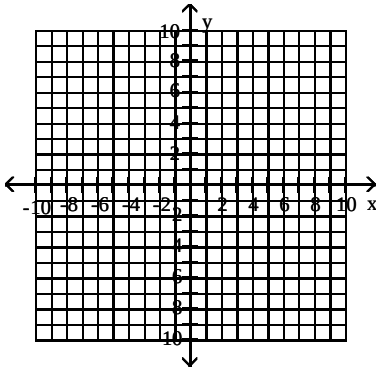


D)

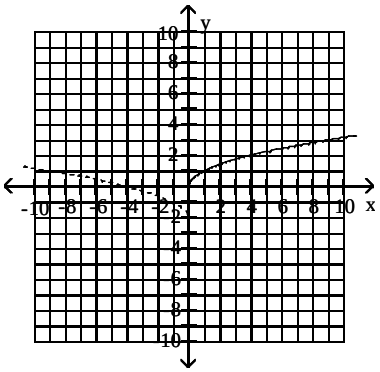


Begin by graphing the standard square root function f(x) = $\sqrt{x}$. Then use transformations of this graph to graph the given function.

2) g(x) = $\sqrt{x}$ – 2



A)



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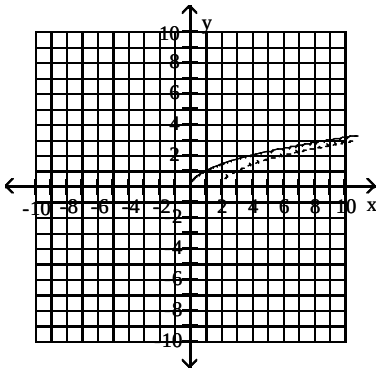
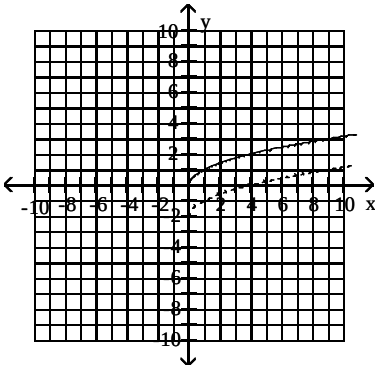
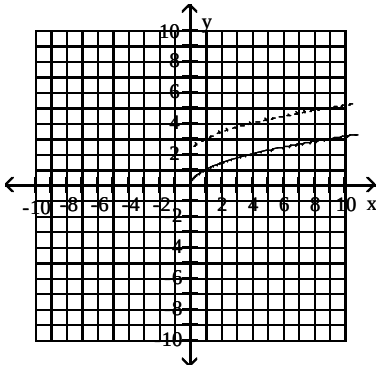


C)

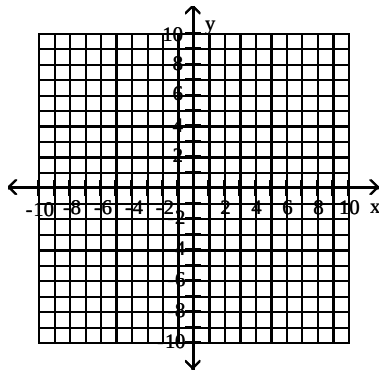


D)

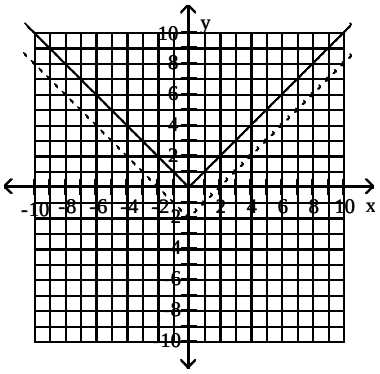


Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

3) g(x) = |x| + 2



A)



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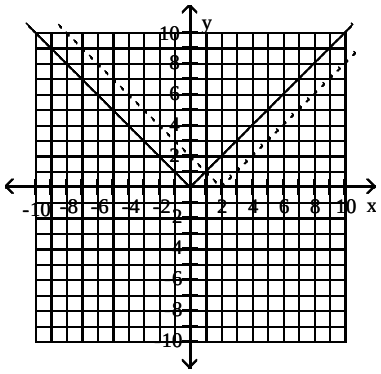

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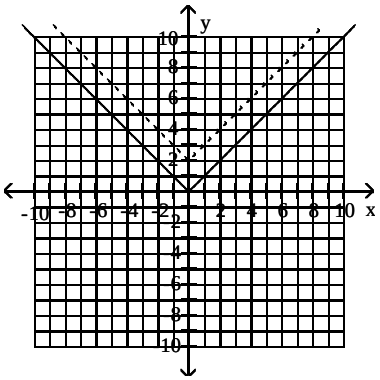
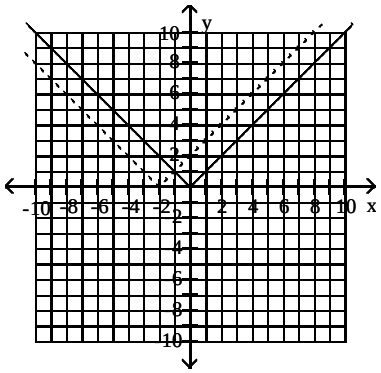
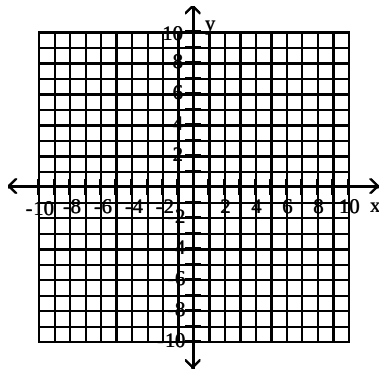


D)

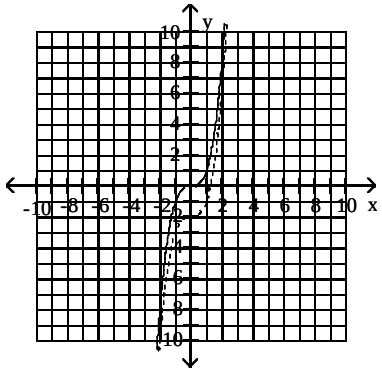


Begin by graphing the standard function $f(x) = x^3$ Then use transformations of this graph to graph the given function.

4) $g(x) = x^3 - 2$



A)



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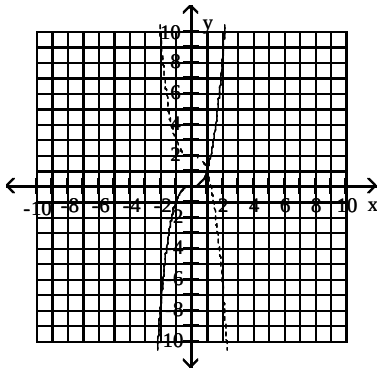

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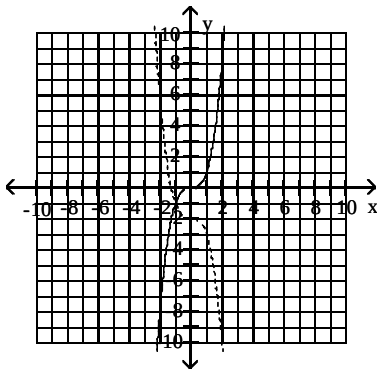
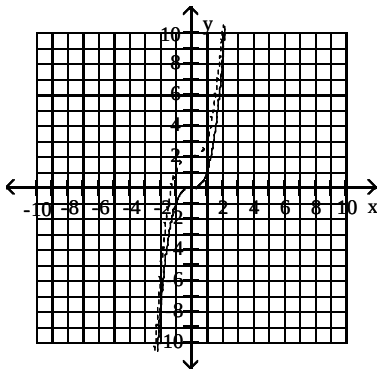
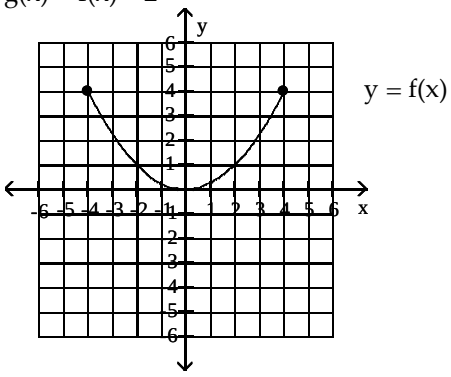


D)

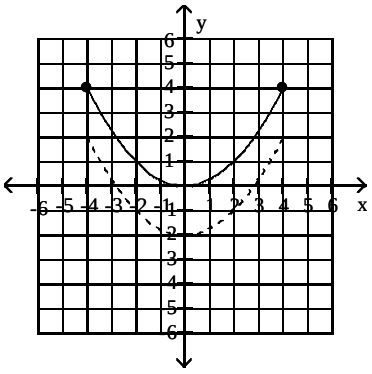


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

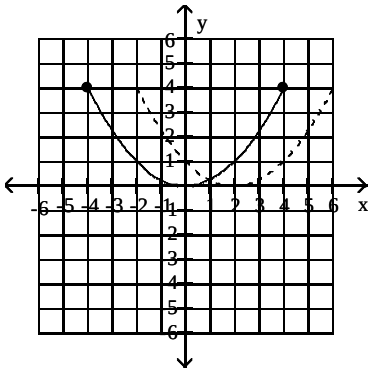
5) g(x) = f(x) – 2



A)



B)



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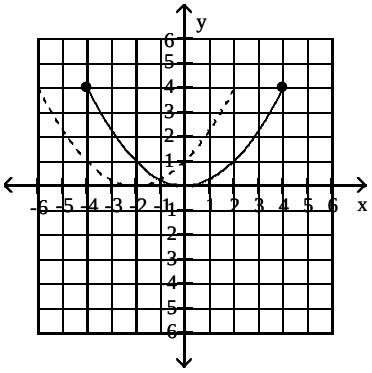
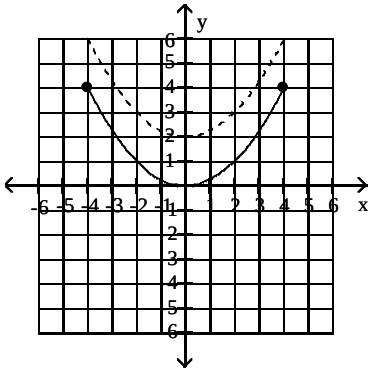
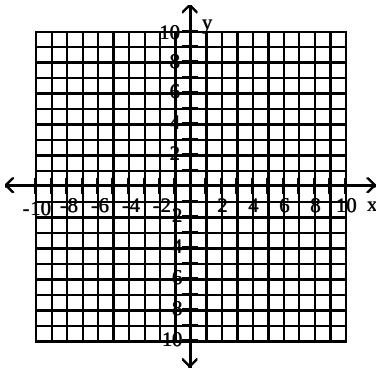


D)

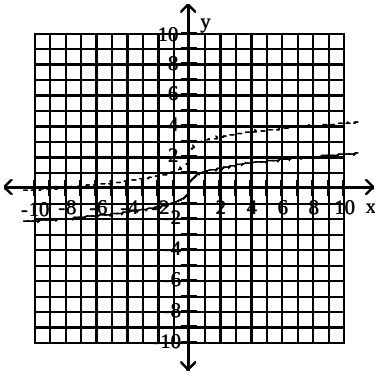


Begin by graphing the standard cube root function f(x) = $\sqrt[3]{x}$ Then use transformations of this graph to graph the given function.

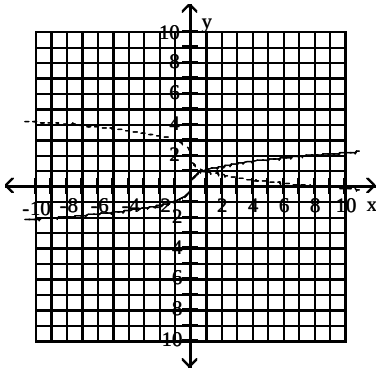
6) $g(x) = \sqrt[3]{x} + 2$



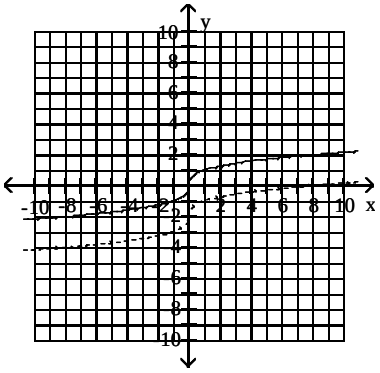
A)



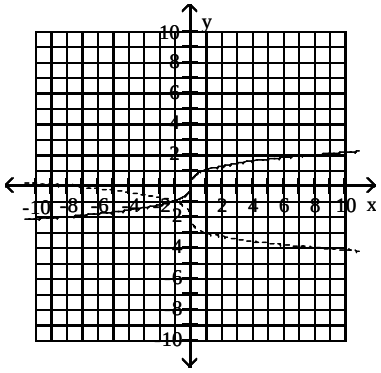
B)



C)



D)

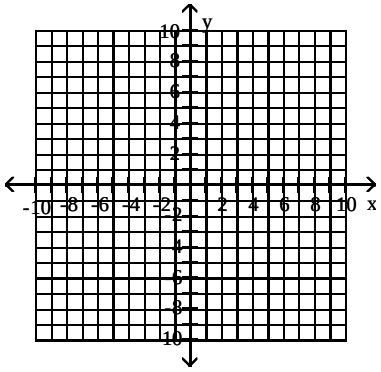


3 Use Horizontal Shifts to Graph Functions

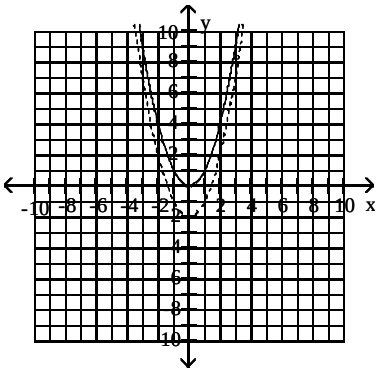
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

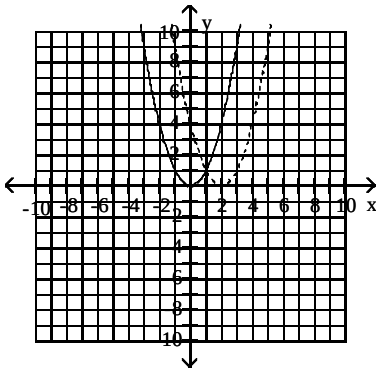
1) $h(x) = (x + 2)^2$



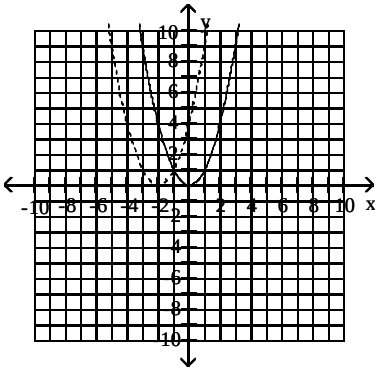
A)



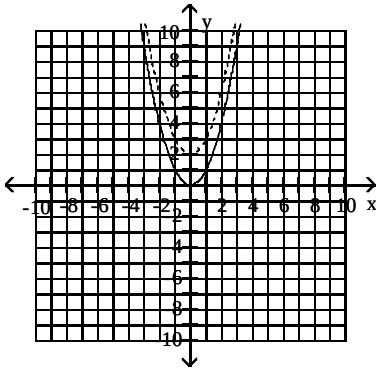
B)



C)

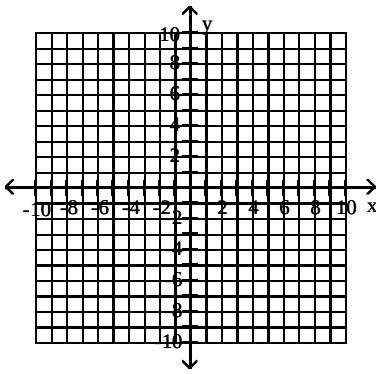


D)

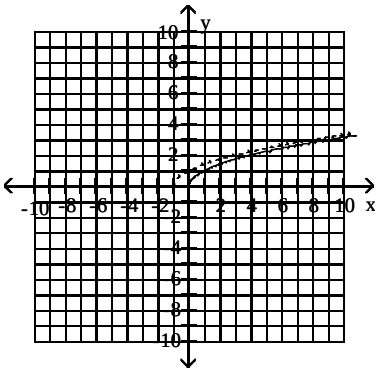


Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

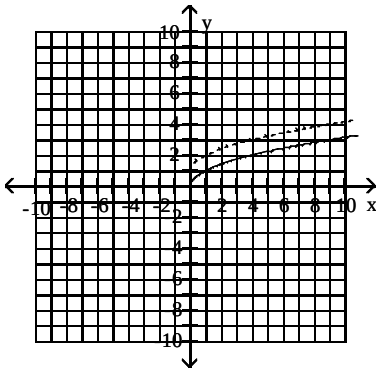
2) $h(x) = \sqrt{x + 1}$



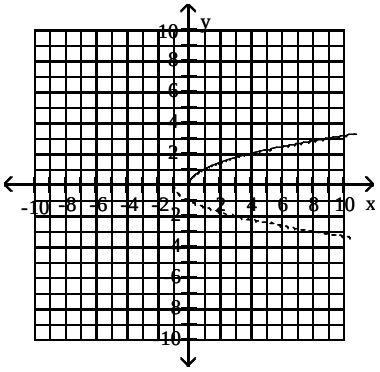
A)



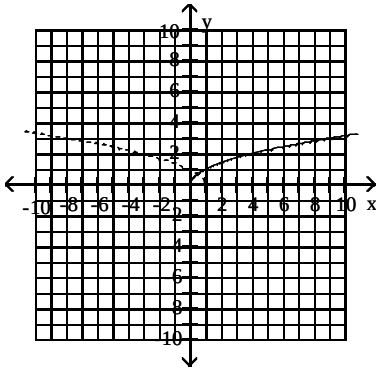
B)



C)

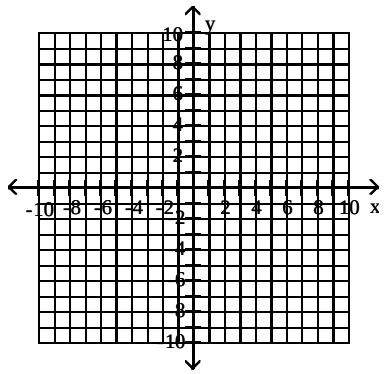


D)

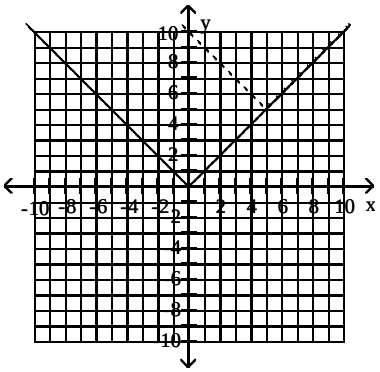


Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

3) h(x) = |x + 5| + 5



A)



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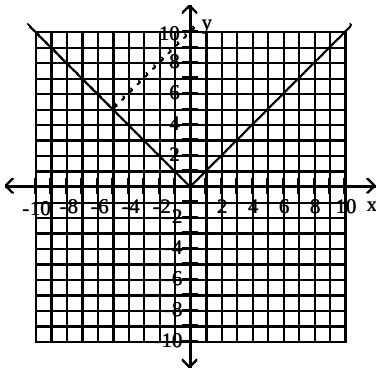

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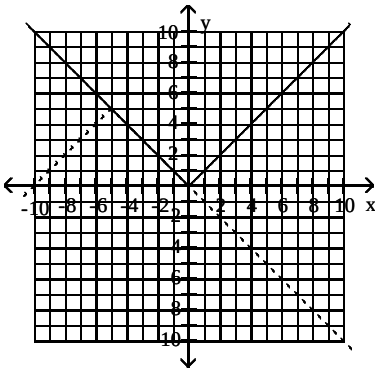
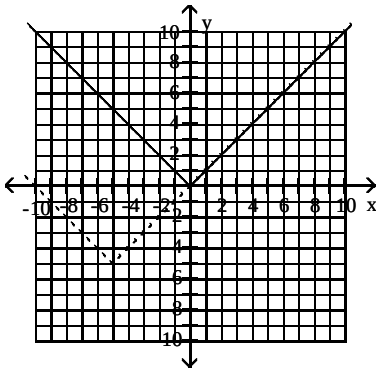
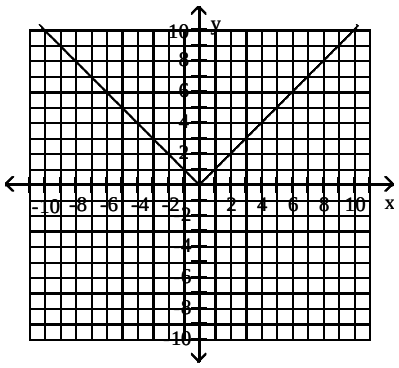


D)

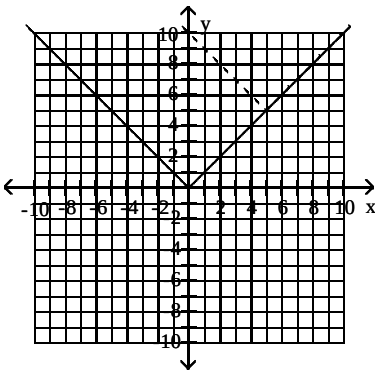


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

4) $g(x) = |x - 5|$



A)



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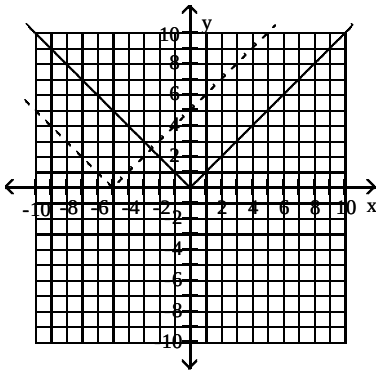
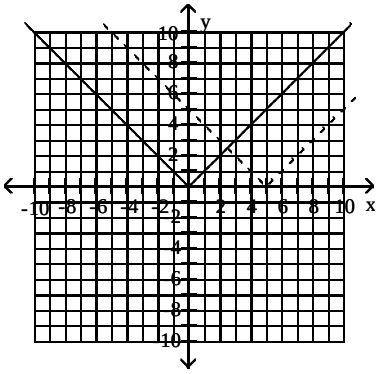


C)



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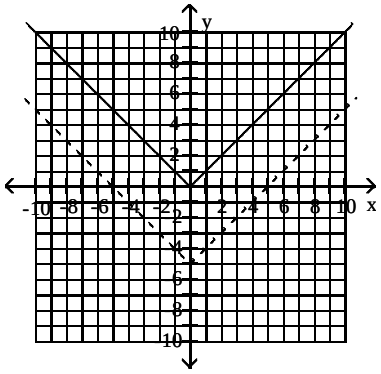
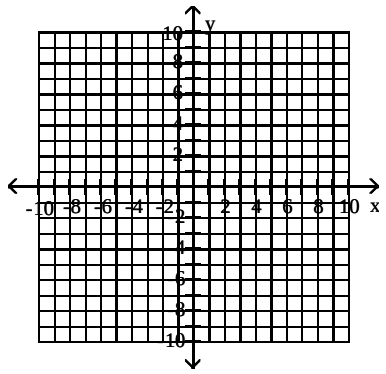
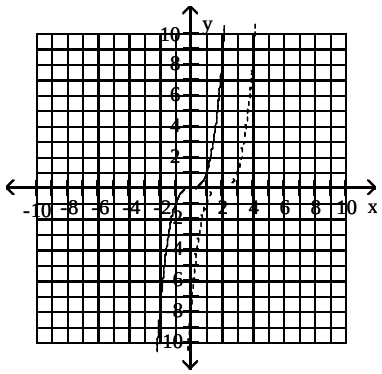


Begin by graphing the standard function $f(x) = x^3$ Then use transformations of this graph to graph the given function.

5) $h(x) = (x + 2)^3$



A)



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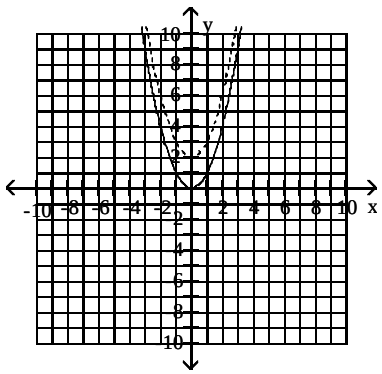

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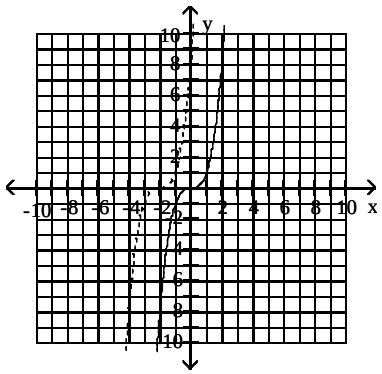

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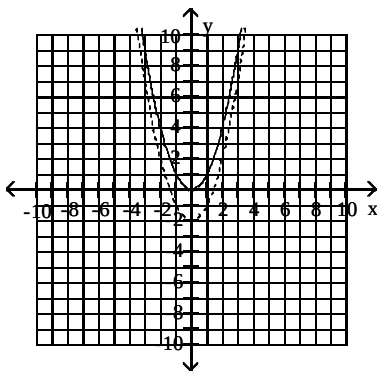
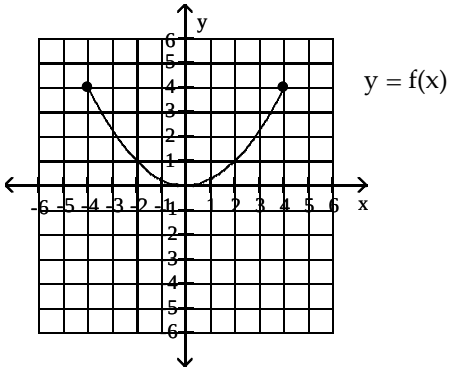
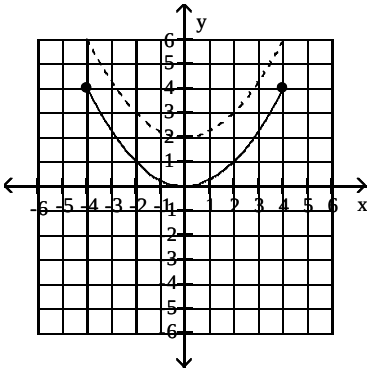


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

6) g(x) = f(x + 2)



A)



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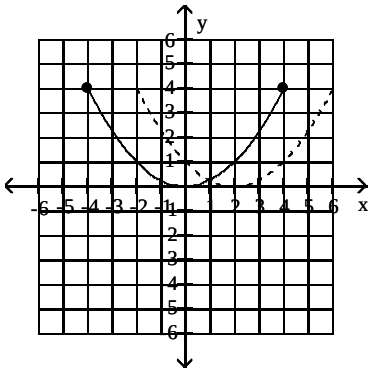
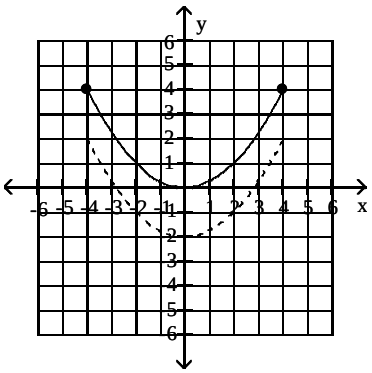
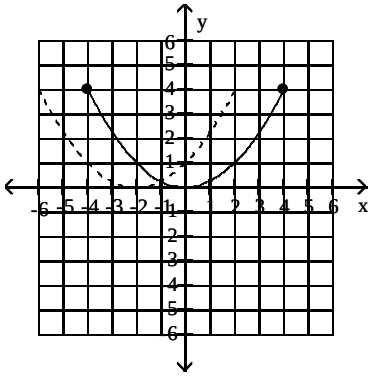


C)



D)

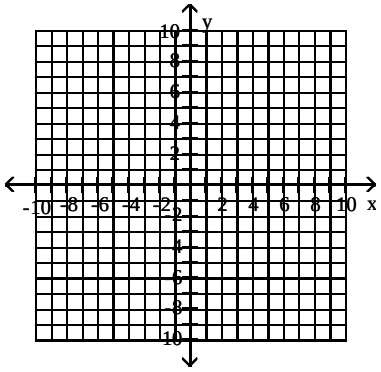


4 Use Reflections to Graph Functions

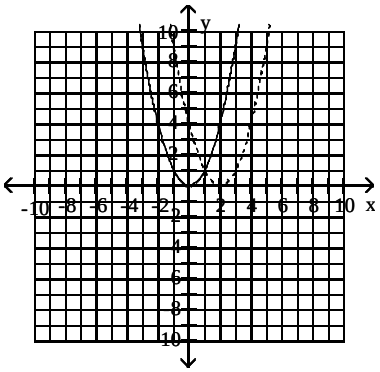
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

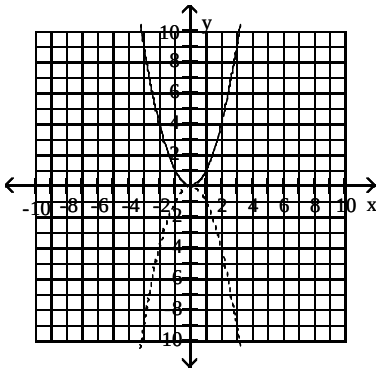
1) $h(x) = -(x - 2)^2$



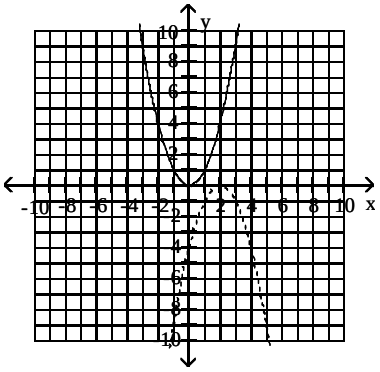
A)



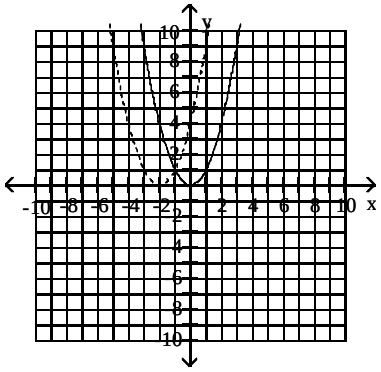
B)



C)

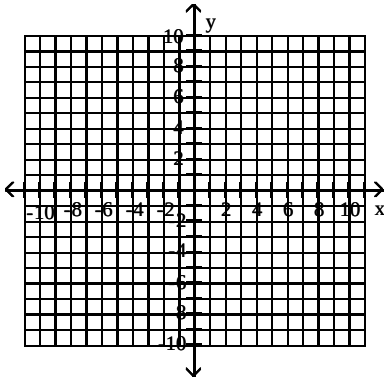


D)

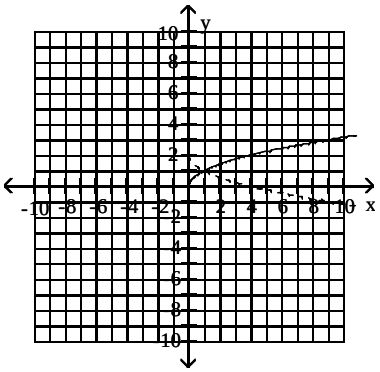


Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

2) $g(x) = -\sqrt{x} + 2$



A)



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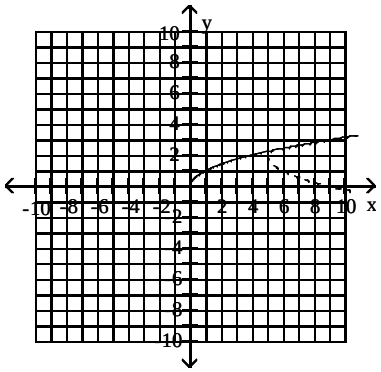
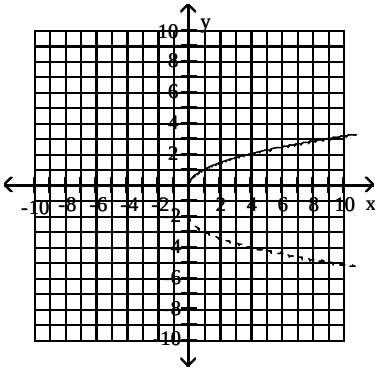
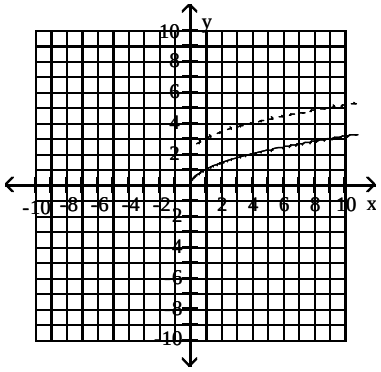


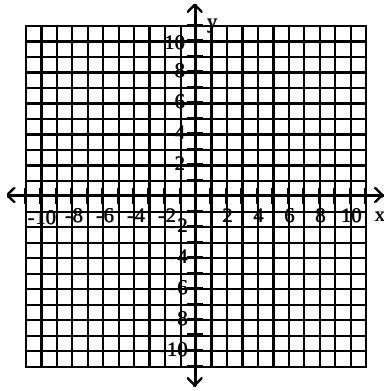
C)



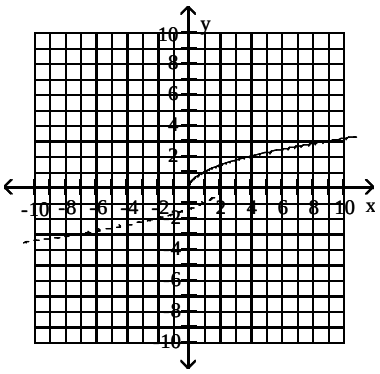
D)



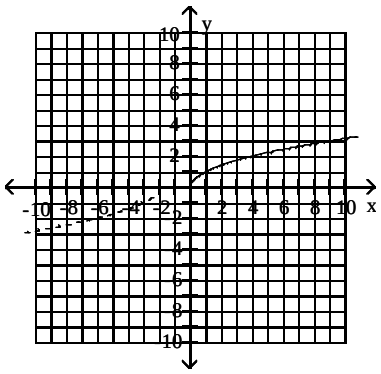
3) $g(x) = \sqrt{-x + 2}$



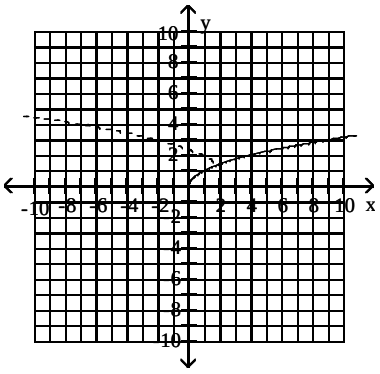
A)



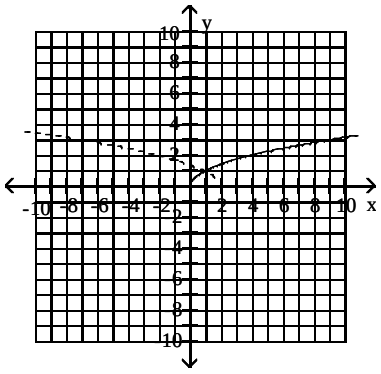
B)



C)

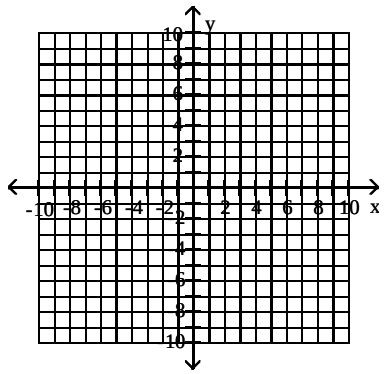


D)

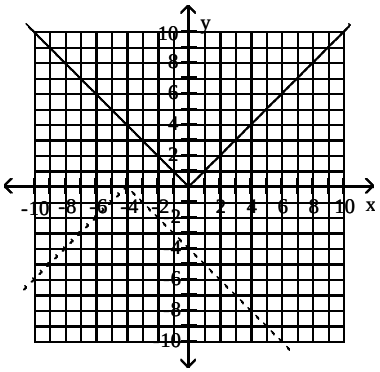


Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

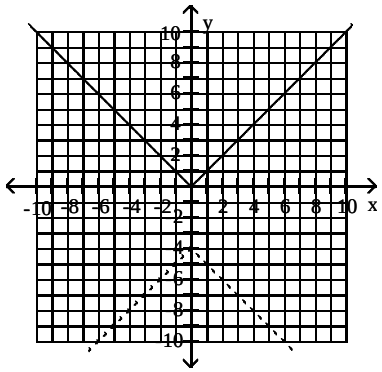
4) h(x) = – |x – 4|



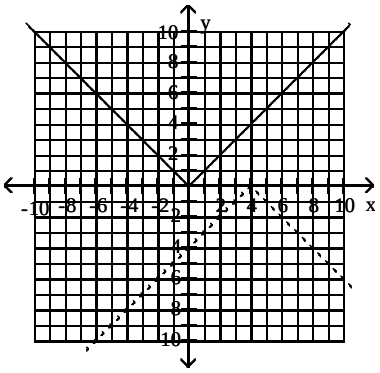
A)



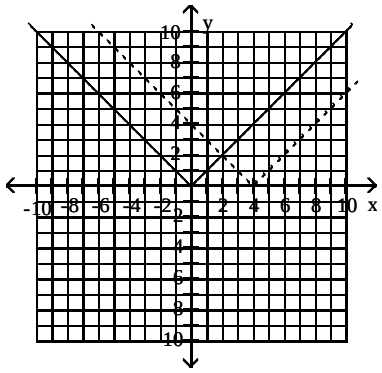
B)



C)

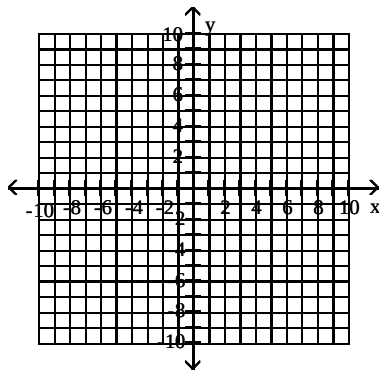


D)

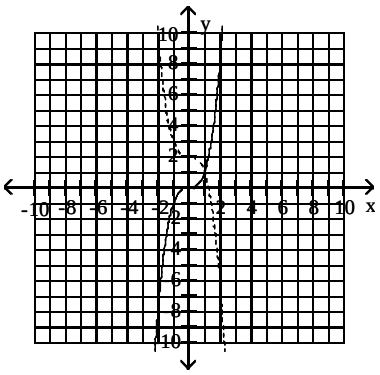


Begin by graphing the standard cubic function $f(x) = x^3$. Then use transformations of this graph to graph the given function.

5) $g(x) = -x^3 + 2$



A)



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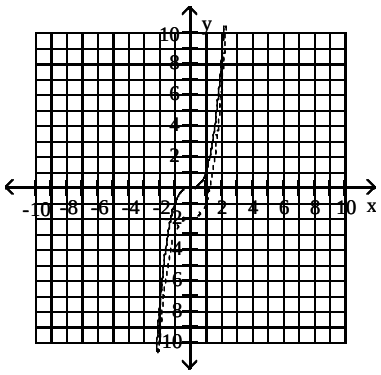
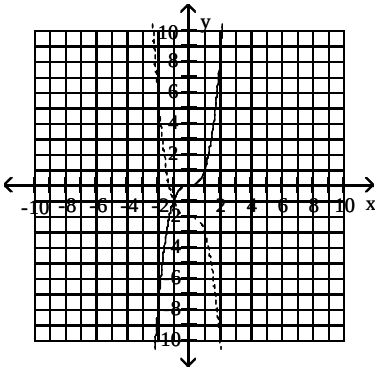
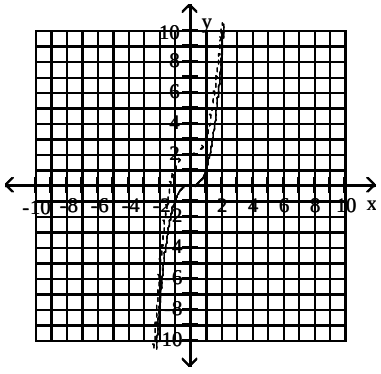


C)

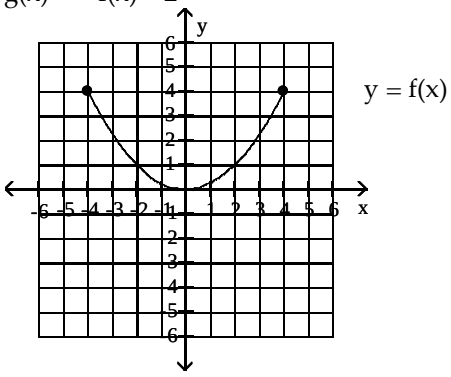


D)

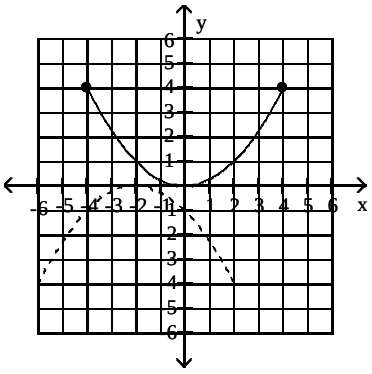


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

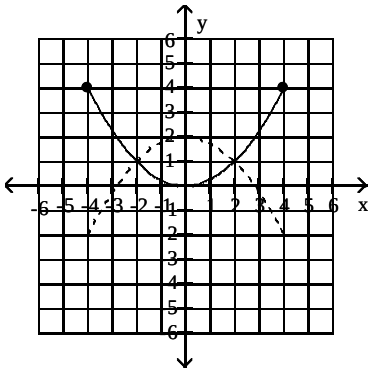
6) $g(x) = -f(x) - 2$



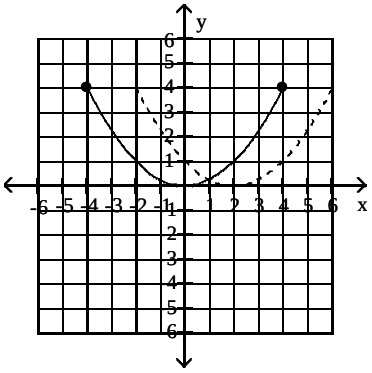
A)



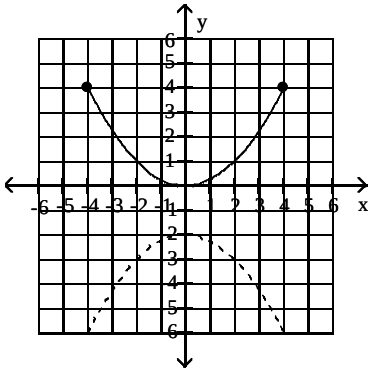
B)



C)



D)

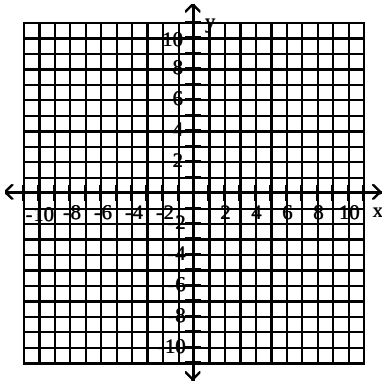


5 Use Vertical Stretching and Shrinking to Graph Functions

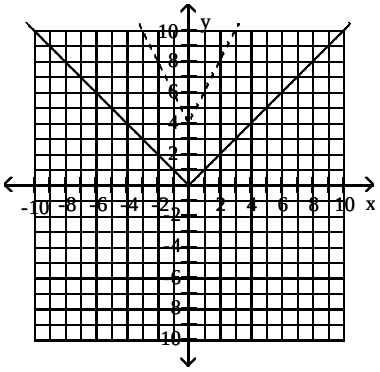
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

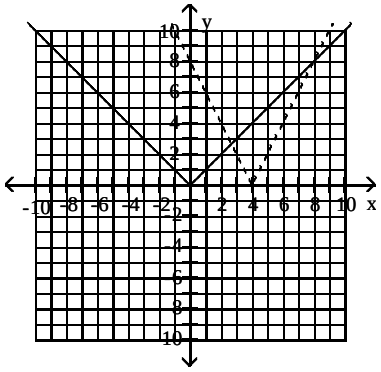
1) h(x) = 2|x| – 4



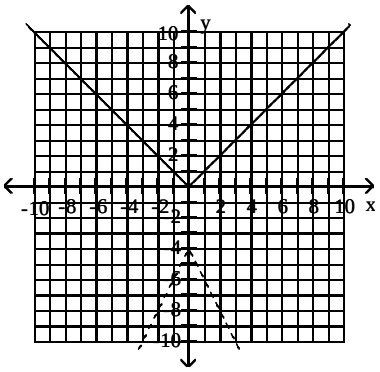
A)



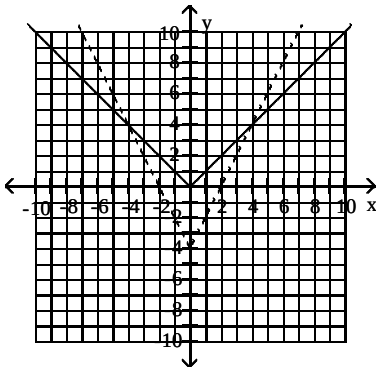
B)



C)

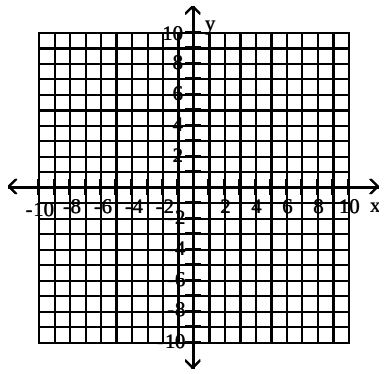


D)

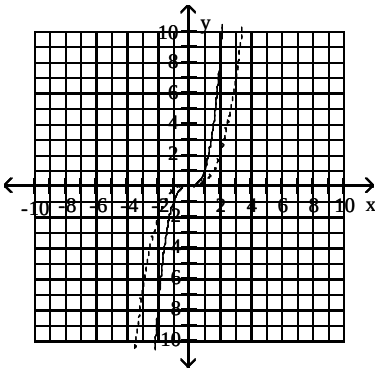


Begin by graphing the standard cubic function $f(x) = x^3$. Then use transformations of this graph to graph the given function.

2) $g(x) = -\frac{1}{4}x^3$



A)



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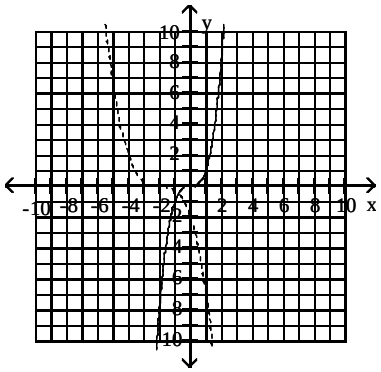
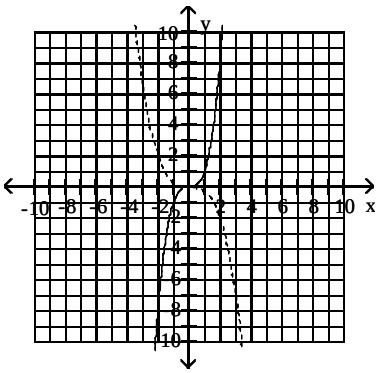
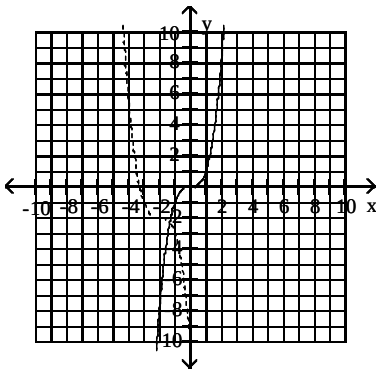


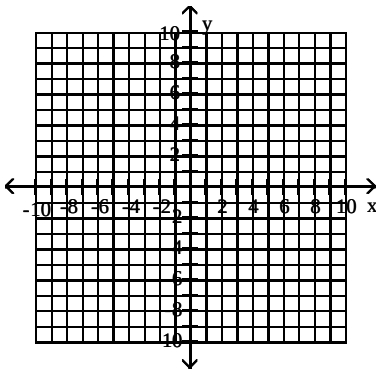
C)



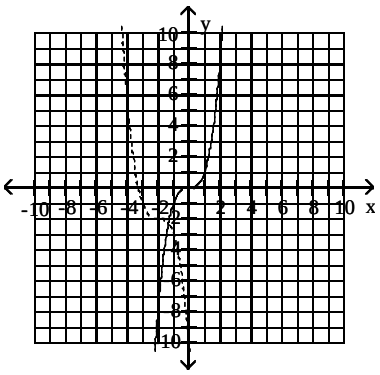
D)



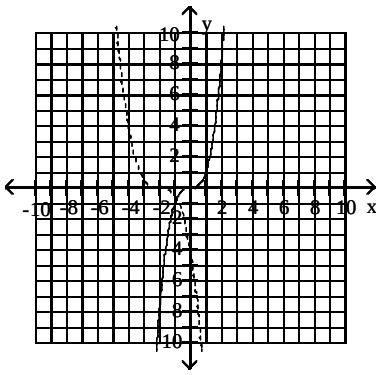
3) $g(x) = \frac{1}{2}x^3$



A)



B)



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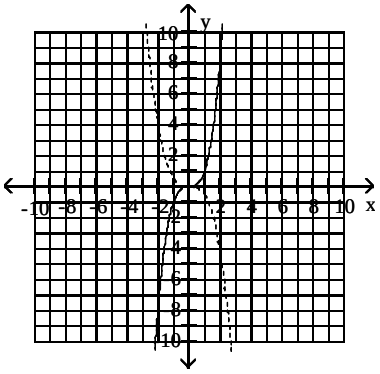

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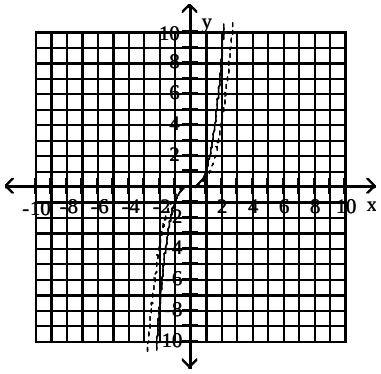
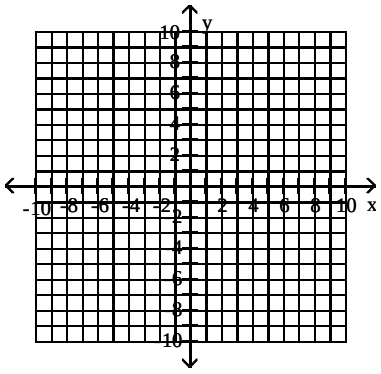
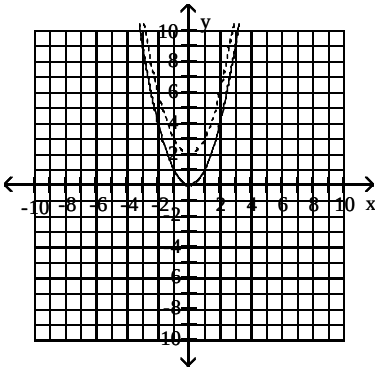


Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

4) $g(x) = -2x^2$



A)



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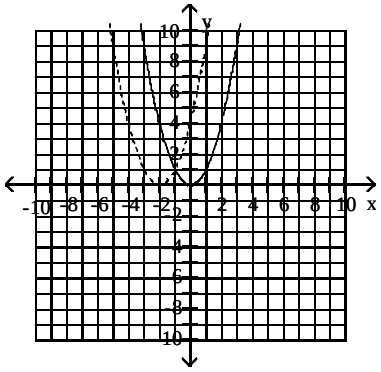
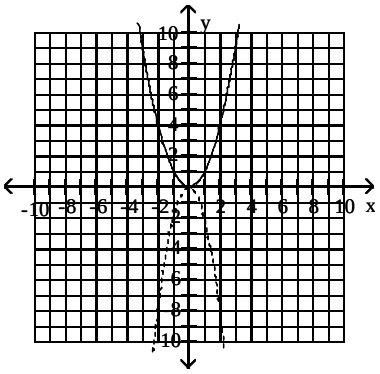
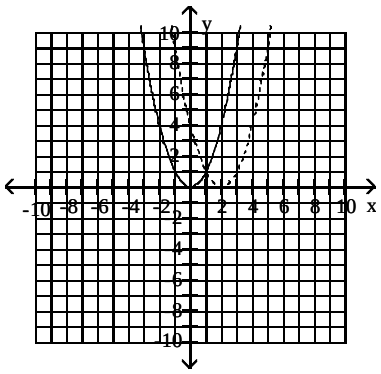


C)

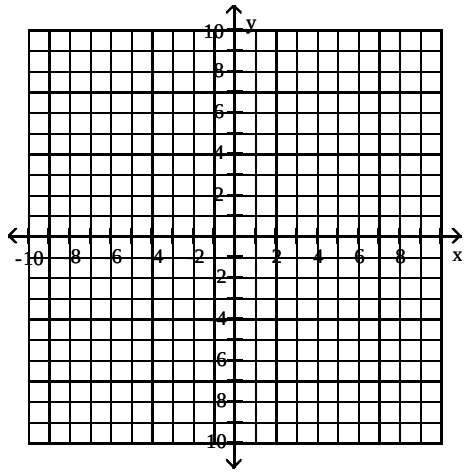


D)

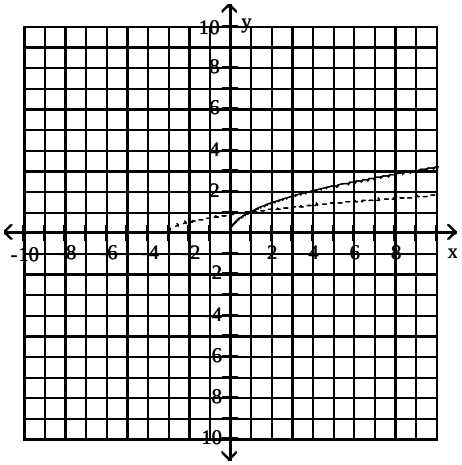


Begin by graphing the square root function $f(x) = \sqrt{x}$ Then use transformations of this graph to graph the given function.

5) $g(x) = 2\sqrt{x + 3}$



A)



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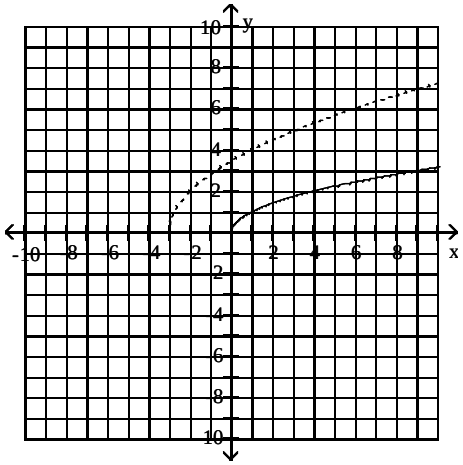
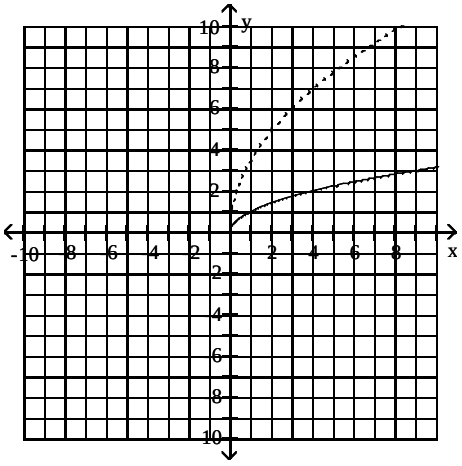
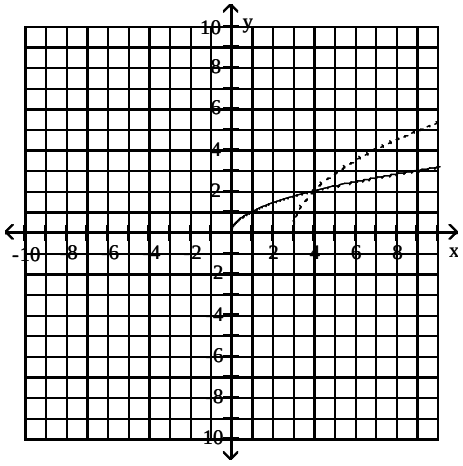


C)

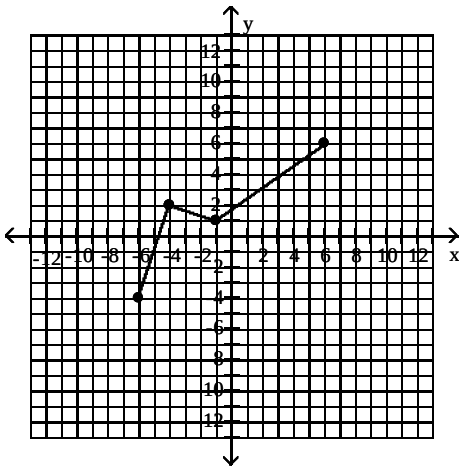


D)

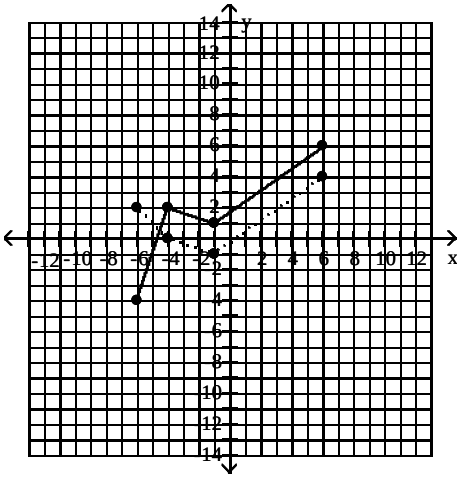


Use the graph of y = f(x) to graph the given function g.

6) g(x) = –2f(x)



A)



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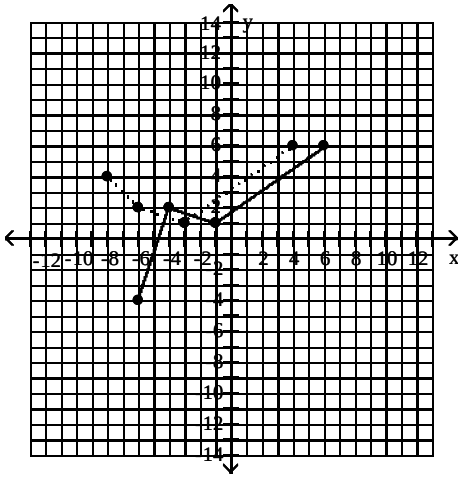
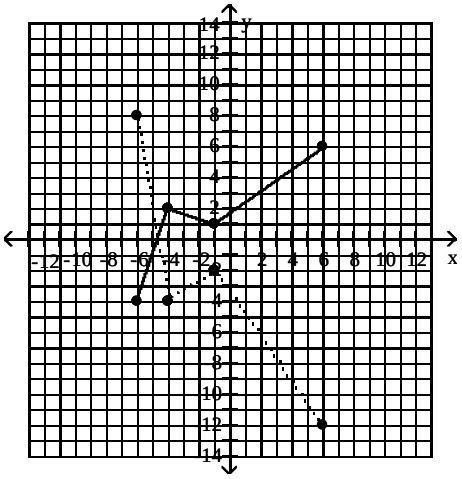
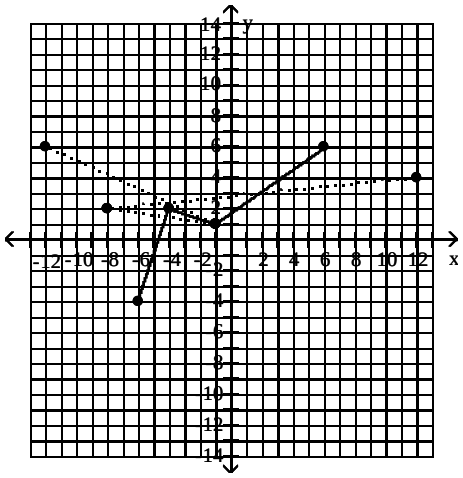


C)



D)

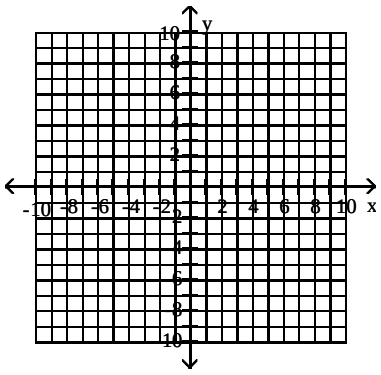


6 Use Horizontal Stretching and Shrinking to Graph Functions

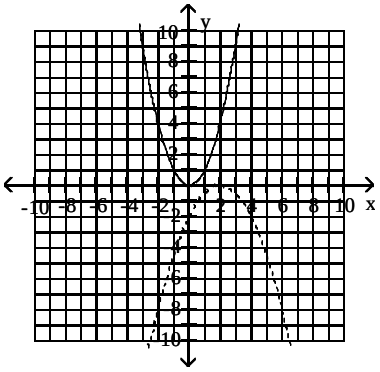
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

1) $h(x) = (\frac{1}{2}x - 2)^2$



A)



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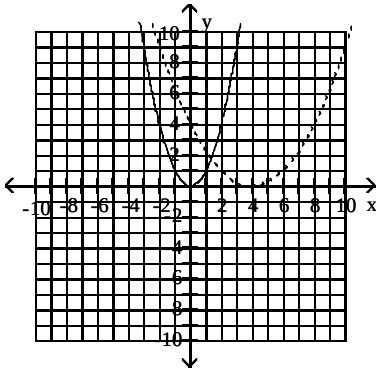
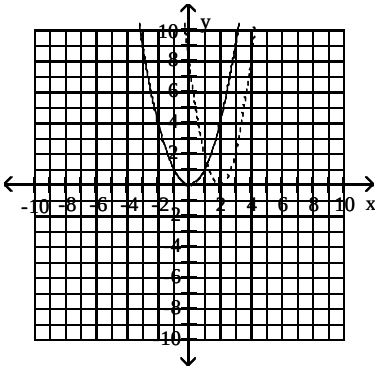
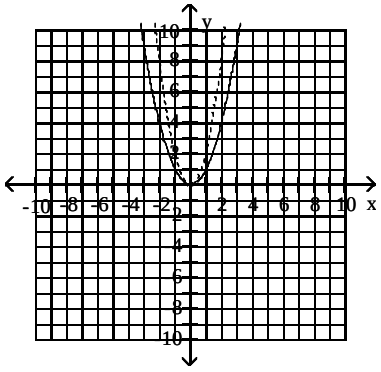


C)

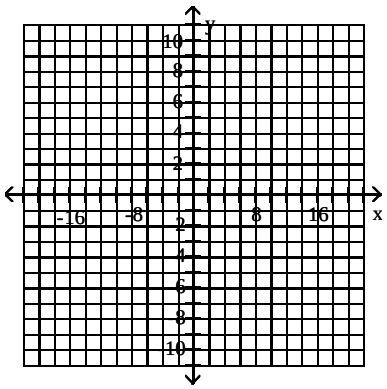


D)

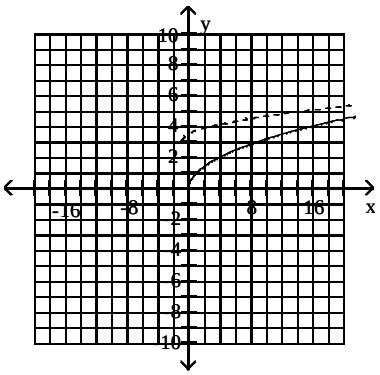


Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

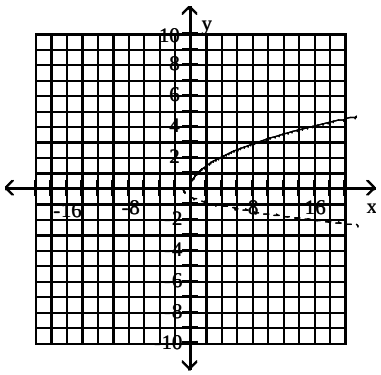
2) $g(x) = \sqrt{\frac{1}{2}x + 1}$



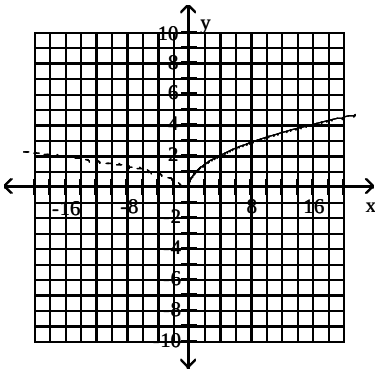
A)



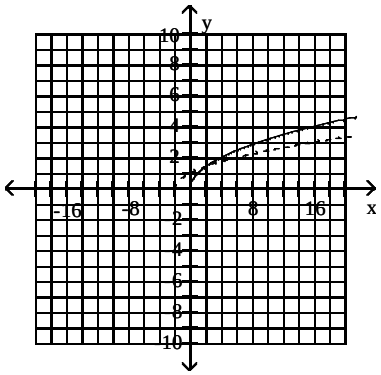
B)



C)

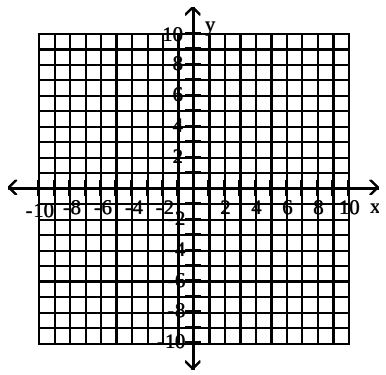


D)

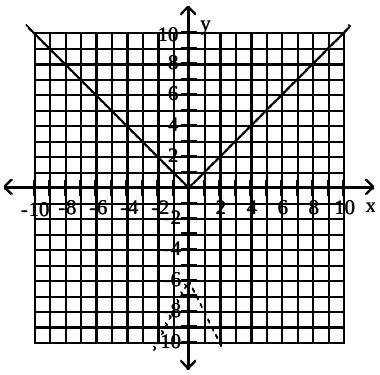


Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

3) g(x) = 2|−6x|



A)



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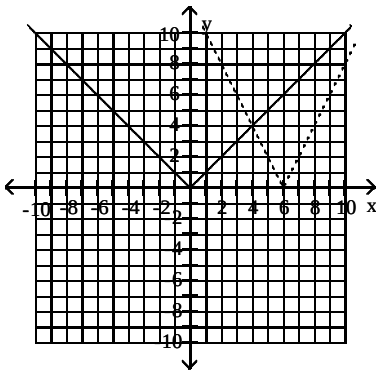
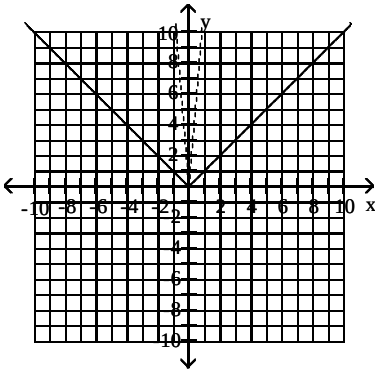
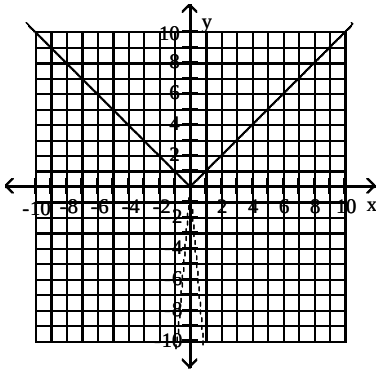


C)

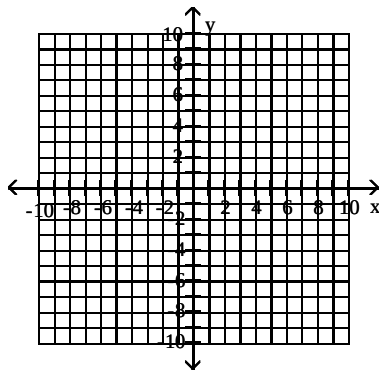


D)

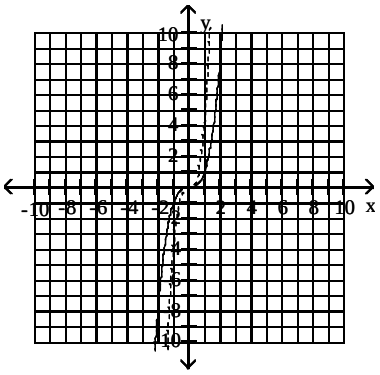


Begin by graphing the standard function $f(x) = x^3$ Then use transformations of this graph to graph the given function.

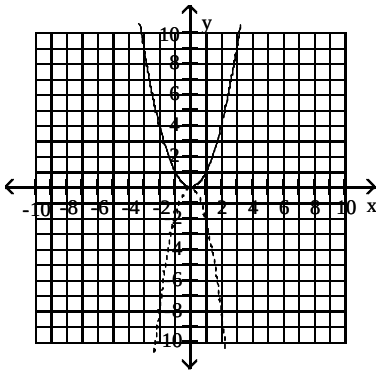
4) $h(x) = \frac{1}{2}(2x)^3$



A)



B)



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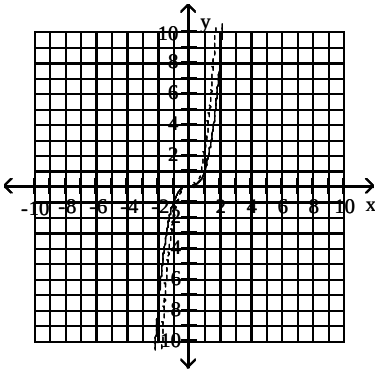
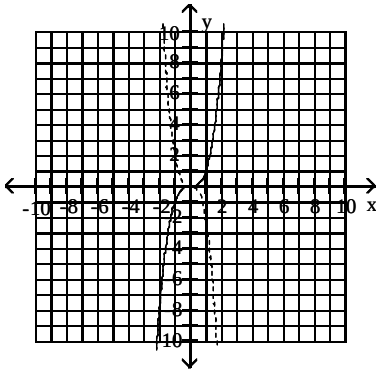
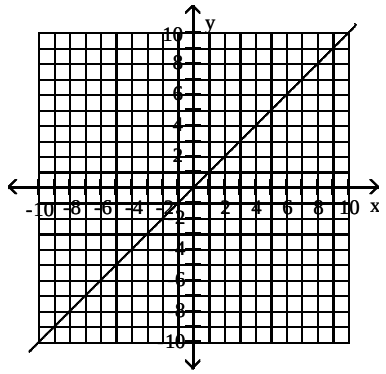


D)

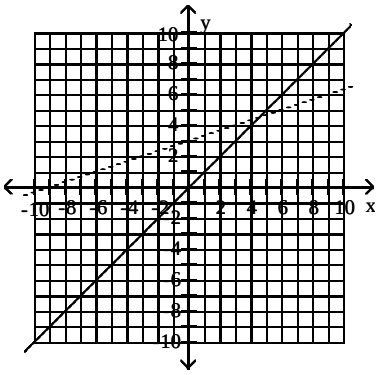


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

5) $g(x) = \frac{1}{3}x + 3$



A)



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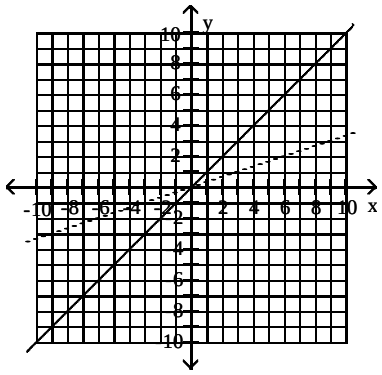

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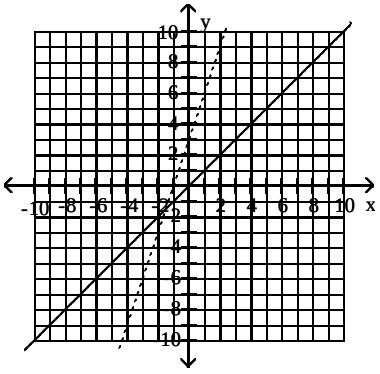

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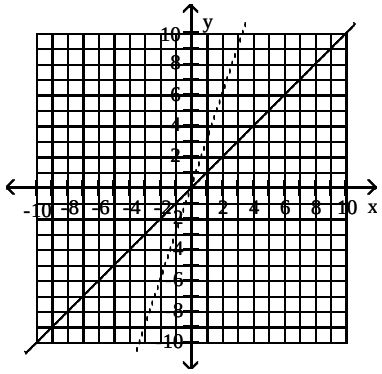
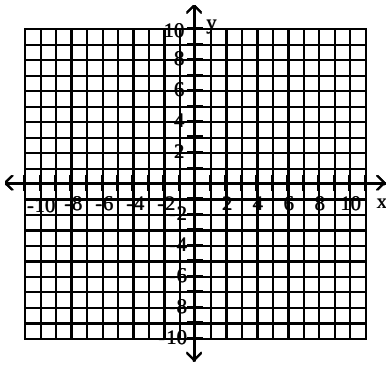


7 Graph Functions Involving a Sequence of Transformations

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

1) $h(x) = (x - 6)^2 + 4$



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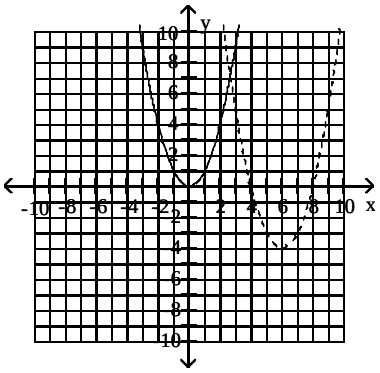

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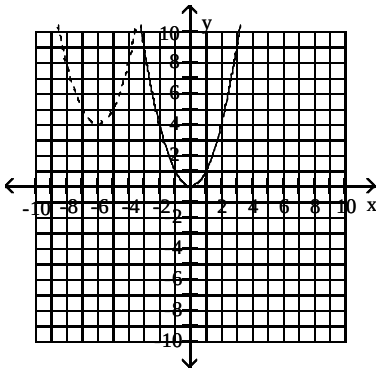

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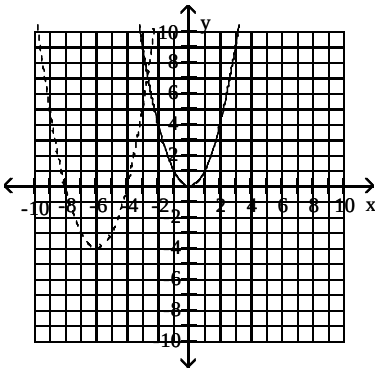

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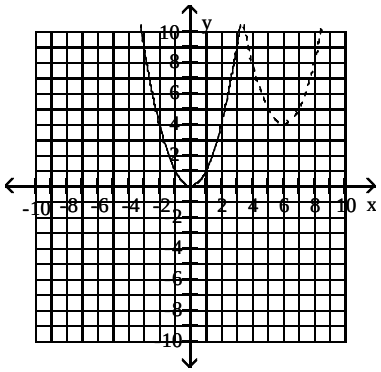
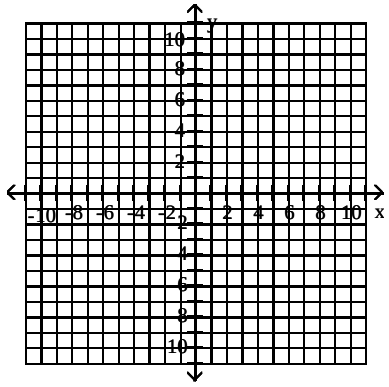
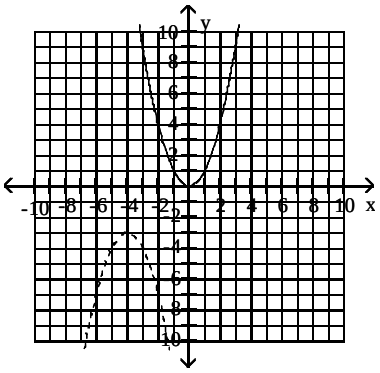


2) $h(x) = -(x + 4)^2 - 3$



A)



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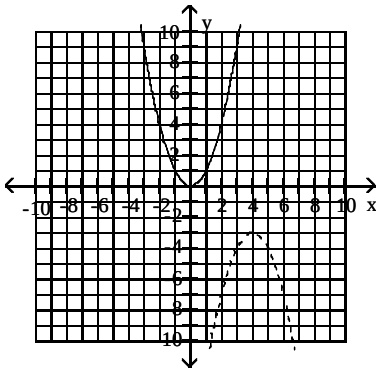

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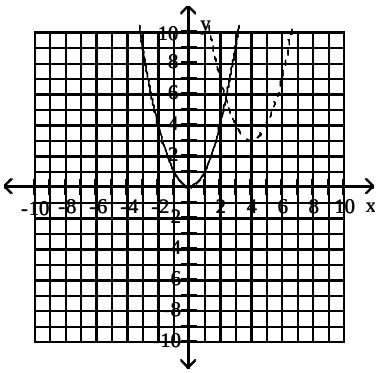

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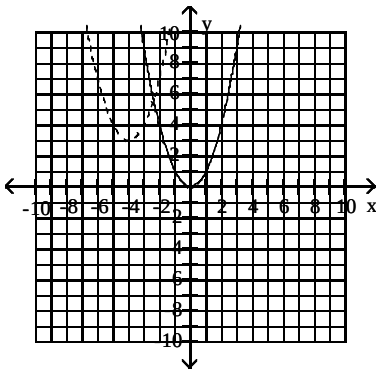
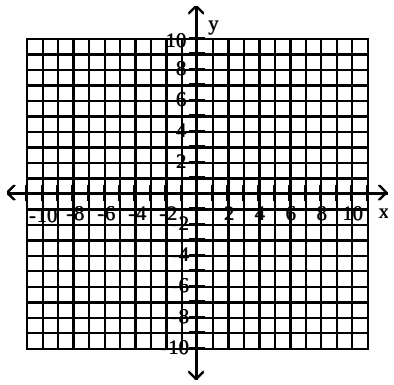
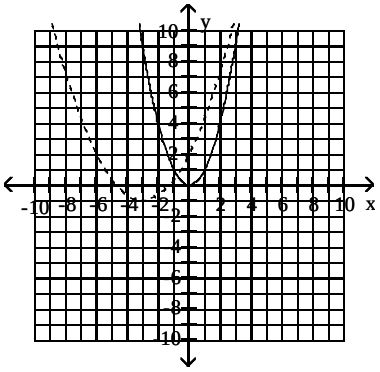


3) $g(x) = -\frac{1}{3}(x+3)^2 - 1$



A)



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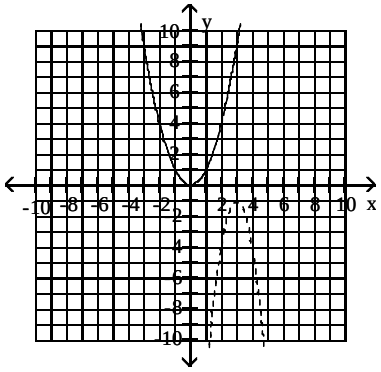

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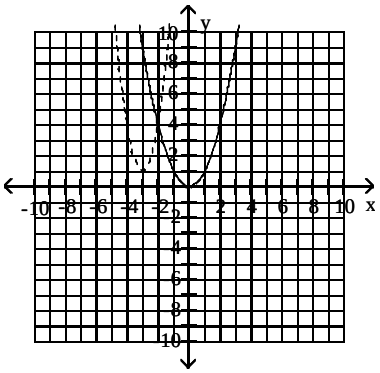

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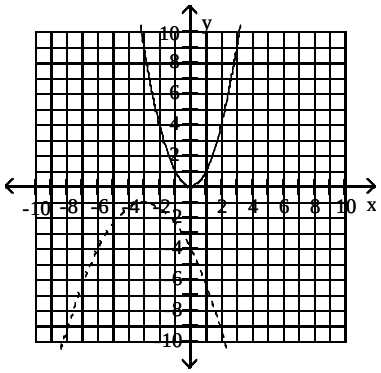
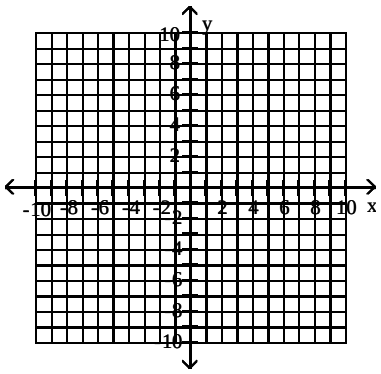


Begin by graphing the standard square root function $f(x) = \sqrt{x}$. Then use transformations of this graph to graph the given function.

4) $g(x) = -\sqrt{x+1} - 1$



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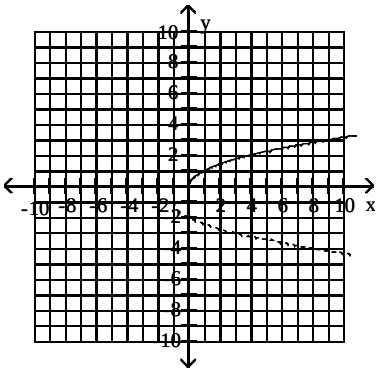

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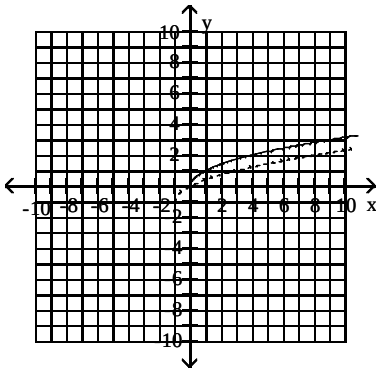

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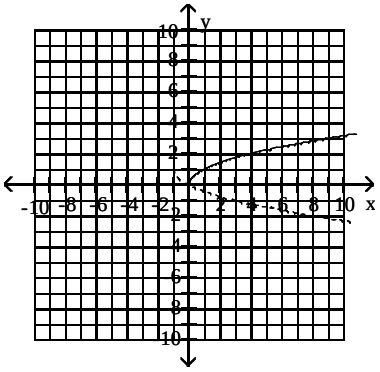

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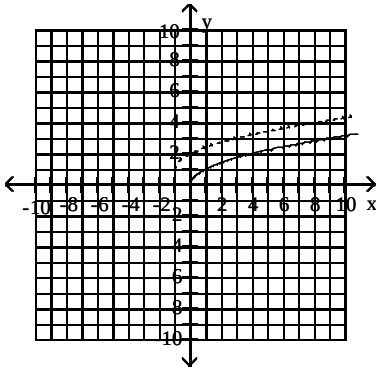
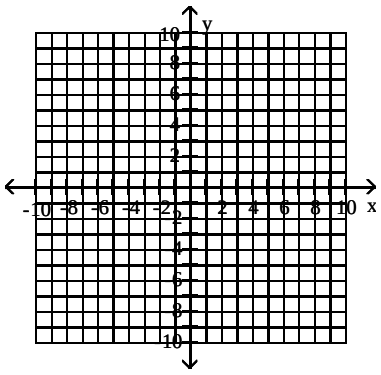


5) $h(x) = \sqrt{-x + 1} - 1$



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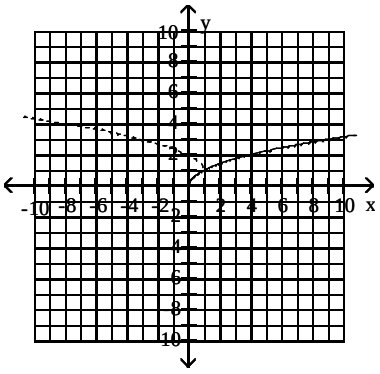

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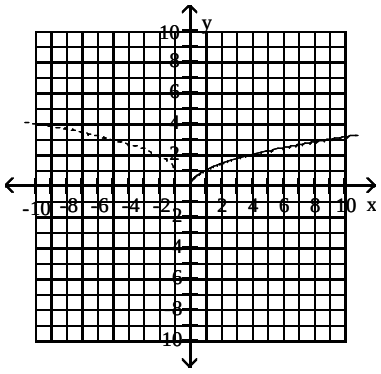

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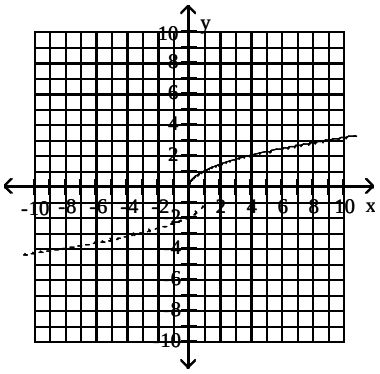

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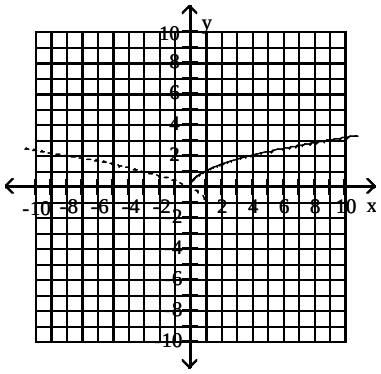
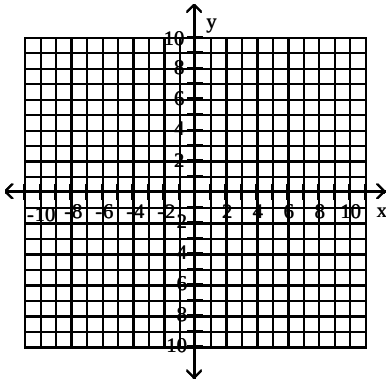


6) $g(x) = \sqrt{x + 2} + 1$



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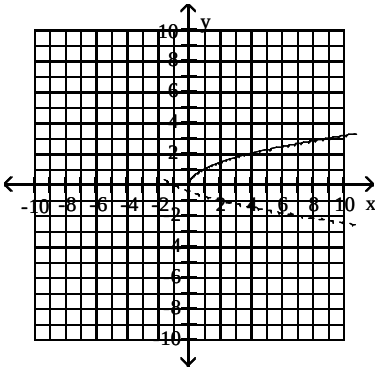

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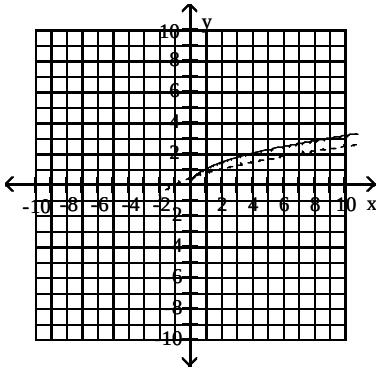

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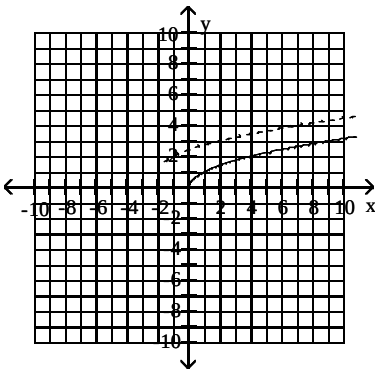

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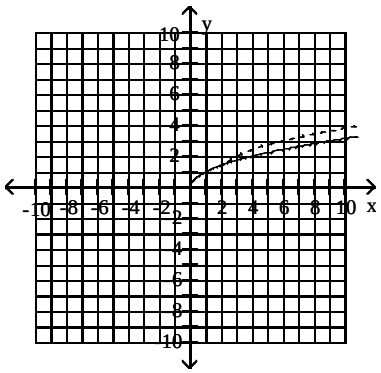
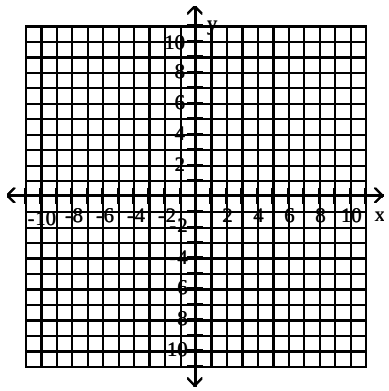
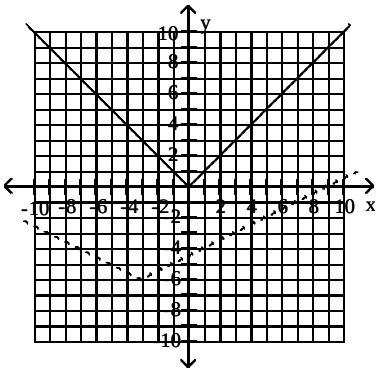


Begin by graphing the standard absolute value function f(x) = |x|. Then use transformations of this graph to graph the given function.

7) $g(x) = \frac{1}{2}|x - 3| + 6$



A)



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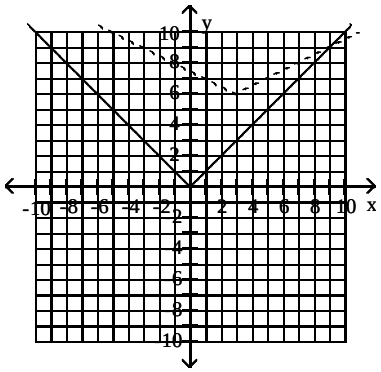

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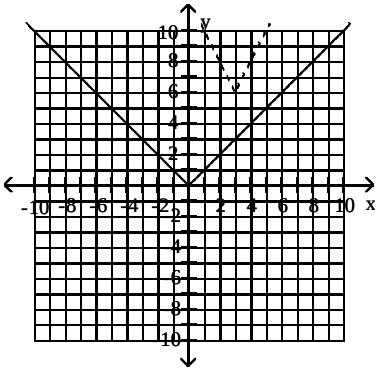

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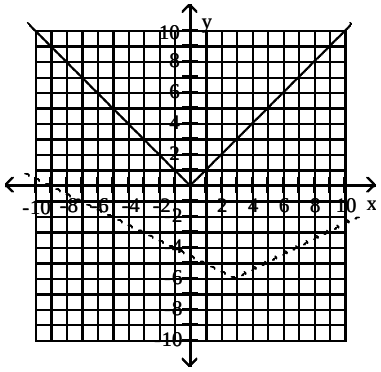
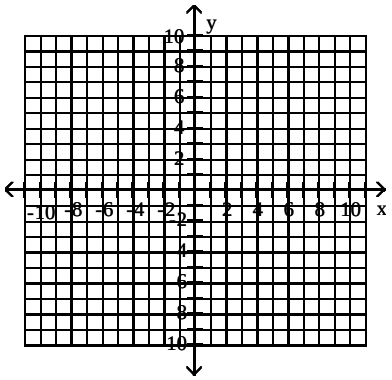


Begin by graphing the standard cubic function $f(x) = x^3$. Then use transformations of this graph to graph the given function.

8) $h(x) = (x - 4)^3 - 5$



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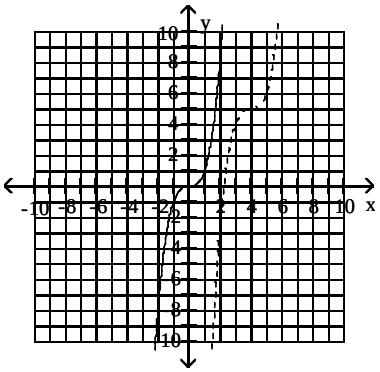

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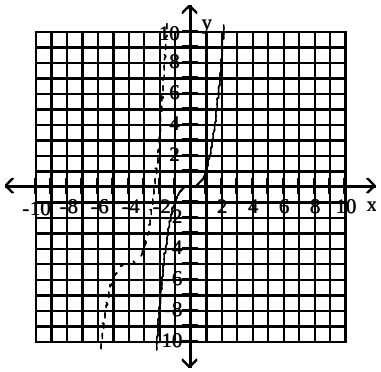

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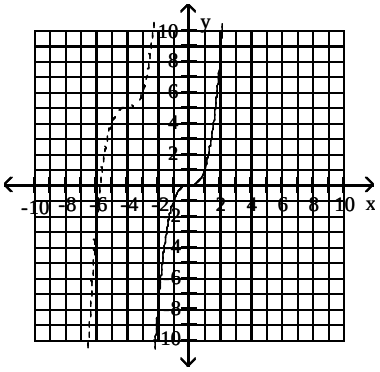

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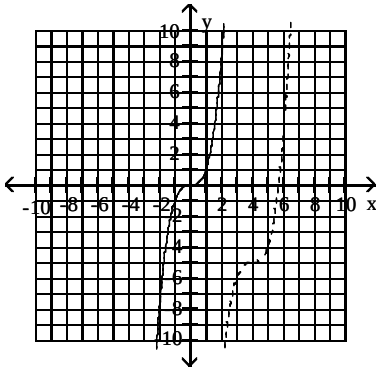
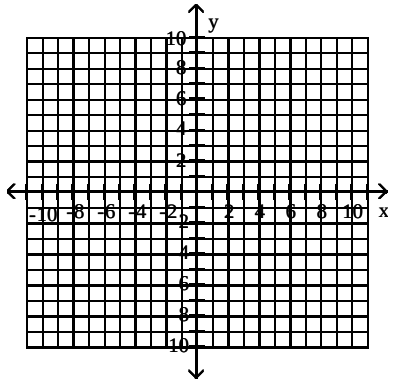
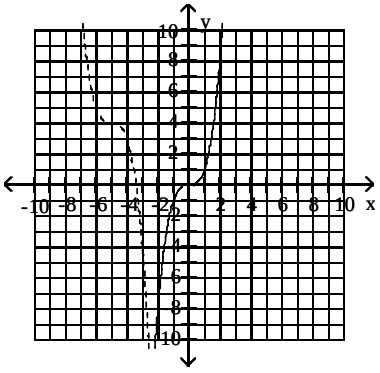


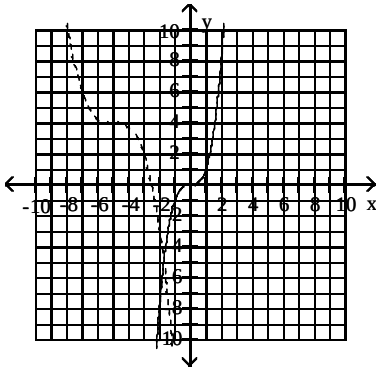
9) $g(x) = -(x + 5)^3 + 4$



A)



B)



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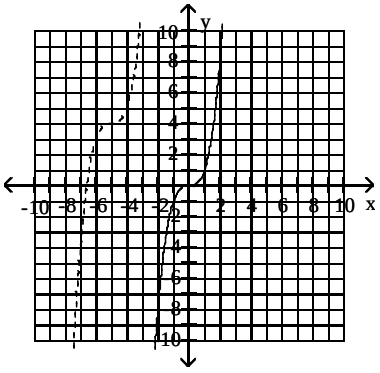

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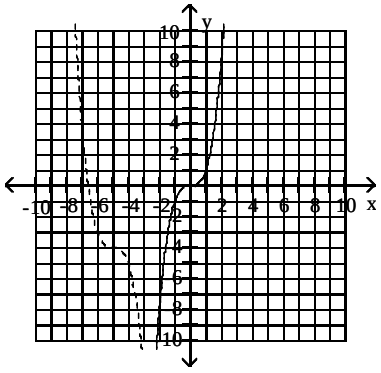
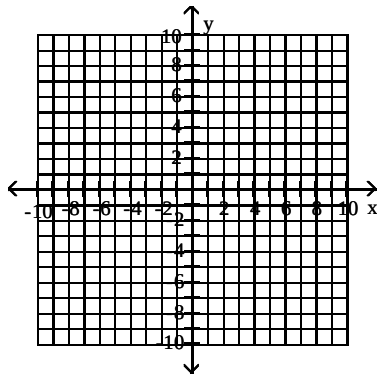
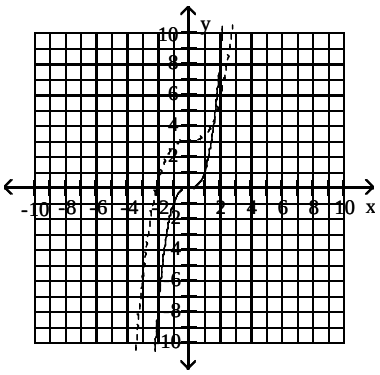


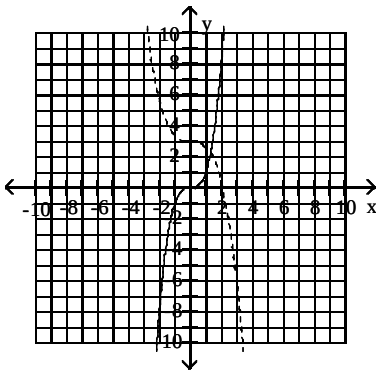
10) $h(x) = \frac{1}{3}x^3 + 3$



A)



B)



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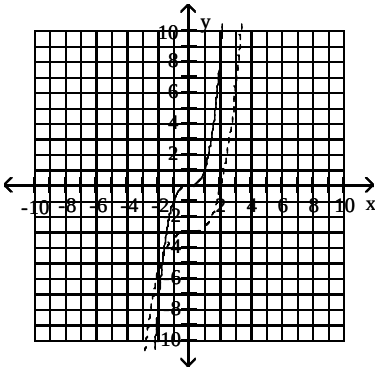
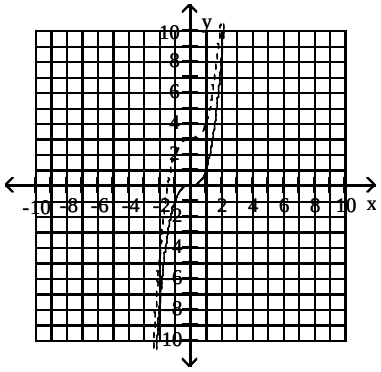
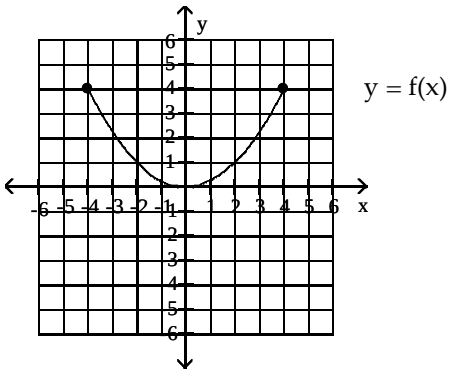


D)

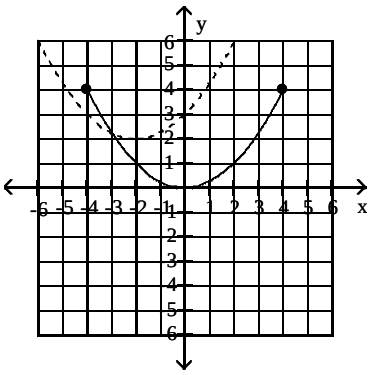


Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

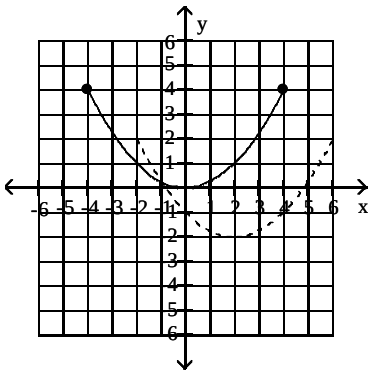
11) $g(x) = f(x + 2) - 2$



A)



B)



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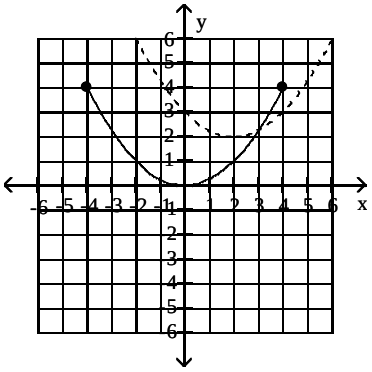
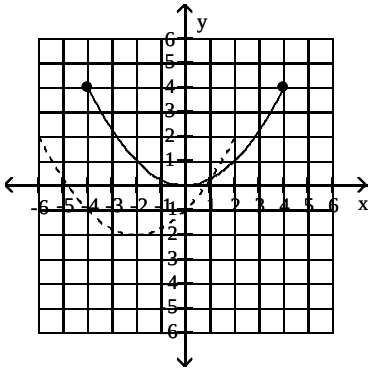
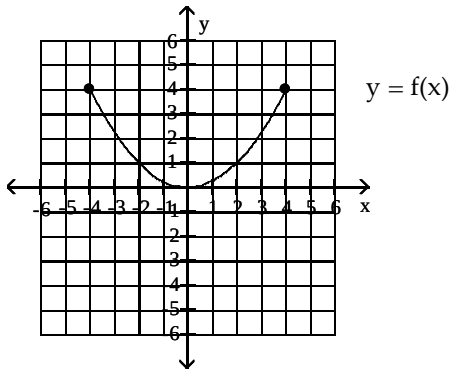


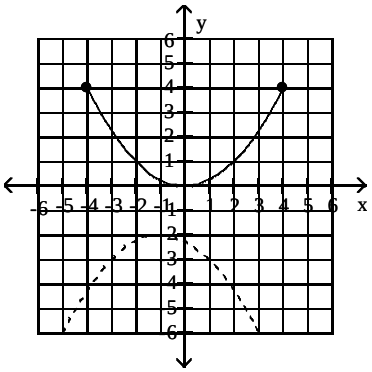
D)



12) $g(x) = -f(x + 1) - 2$



A)



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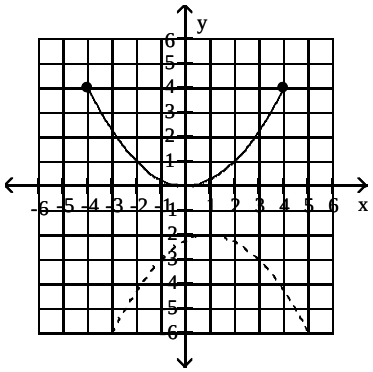

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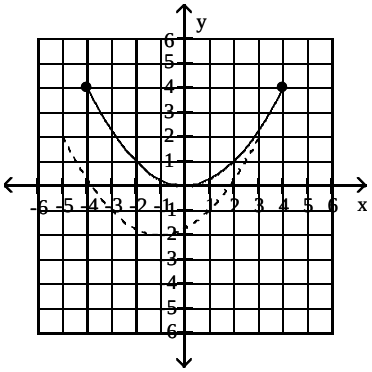
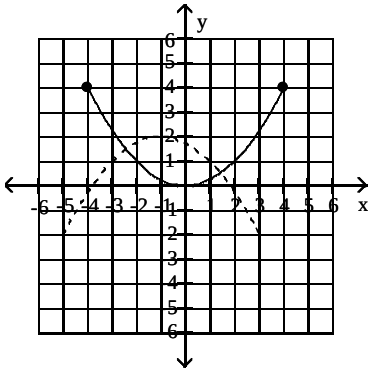
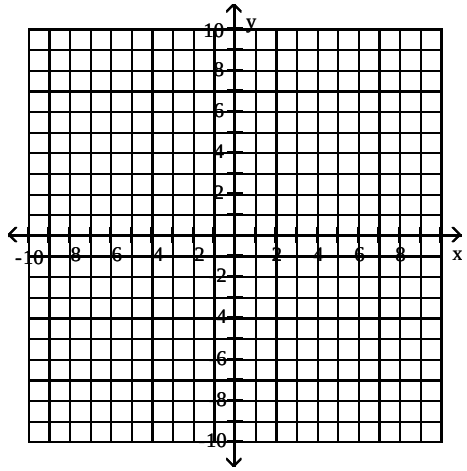


D)

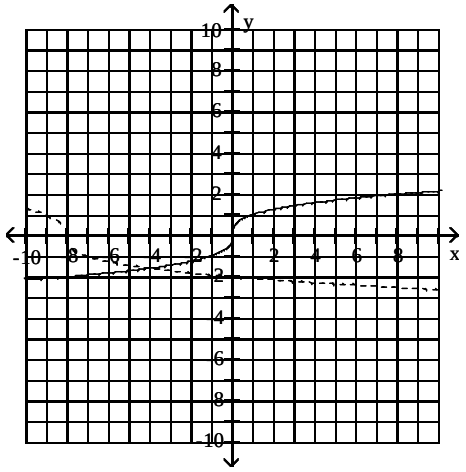


Begin by graphing the cube root function f(x) = $\sqrt[3]{x}$ Then use transformations of this graph to graph the given function.

13) g(x) = $-\sqrt[3]{x+8}$



A)



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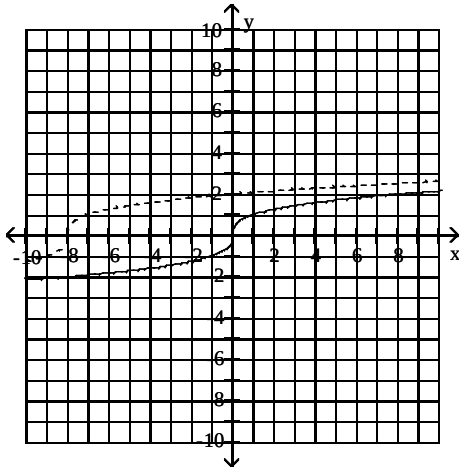
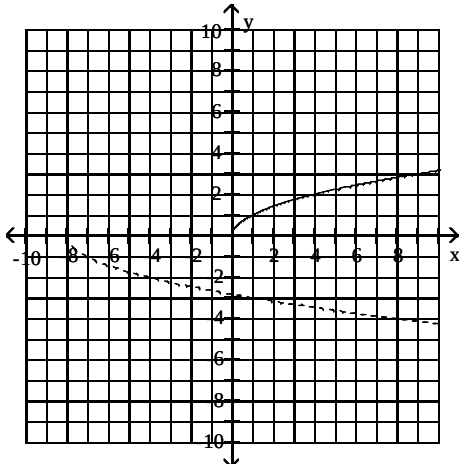
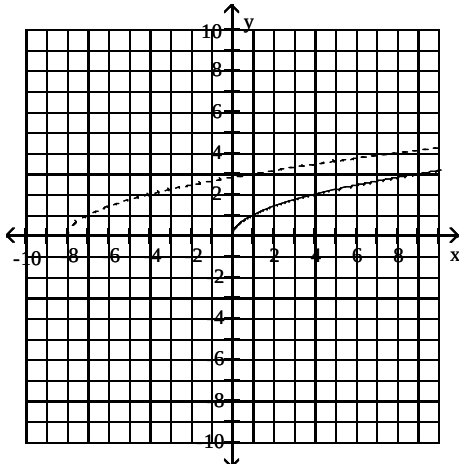


C)



D)



1.7 Combinations of Functions; Composite Functions

1 Find the Domain of a Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the domain of the function.

1) $f(x) = 4x + 8$

A) $(0, \infty)$ B) $(-\infty, \infty)$ C) $(-\infty, 0) \cup (0, \infty)$ D) $[-8, \infty)$

2) $f(x) = x^2 + 4$

A) $(-\infty, -4) \cup (-4, \infty)$ B) $(-4, \infty)$ C) $[-4, \infty)$ D) $(-\infty, \infty)$

3) $f(x) = \dfrac{x}{x^2 + 10}$

A) $(-10, \infty)$ B) $(-\infty, \infty)$

C) $(-\infty, 0) \cup (0, \infty)$ D) $(-\infty, -10) \cup (-10, \infty)$

4) $g(x) = \dfrac{2x}{x^2 - 49}$

A) $(-\infty, \infty)$ B) $(49, \infty)$

C) $(-\infty, 0) \cup (0, \infty)$ D) $(-\infty, -7) \cup (-7, 7) \cup (7, \infty)$

5) $h(x) = \dfrac{x - 3}{x^3 - 16x}$

A) $(-\infty, -4) \cup (-4, 0) \cup (0, 4) \cup (4, \infty)$ B) $(-\infty, 3) \cup (3, \infty)$

C) $(-\infty, 0) \cup (0, \infty)$ D) $(-\infty, \infty)$

6) $f(x) = \sqrt{5 - x}$

A) $(-\infty, 5]$ B) $(-\infty, 5) \cup (5, \infty)$ C) $(-\infty, \sqrt{5}) \cup (\sqrt{5}, \infty)$ D) $(-\infty, \sqrt{5}]$

7) $\dfrac{x}{\sqrt{x - 8}}$

A) $(8, \infty)$ B) $(-\infty, 8) \cup (8, \infty)$ C) $(-\infty, \infty)$ D) $[8, \infty)$

8) $f(x) = \dfrac{1}{x - 9}$

A) $(9, \infty)$ B) $(-\infty, 9) \cup (9, \infty)$ C) $(-\infty, \infty)$ D) $(-\infty, 0) \cup (0, \infty)$

9) $f(x) = \dfrac{6x}{x - 5}$

A) $(-\infty, 5) \cup (5, \infty)$ B) $(-\infty, 5)$ C) $(-\infty, \infty)$ D) $(-\infty, 0) \cup (0, \infty)$

10) $f(x) = x - \dfrac{6}{x + 5}$

A) $(-\infty, -5) \cup (-5, 6) \cup (6, \infty)$ B) $(-\infty, -5) \cup (-5, \infty)$

C) $(-\infty, 6) \cup (6, \infty)$ D) $(-\infty, \infty)$

11) $f(x) = \frac{1}{x - 7} + \frac{4}{x + 1}$

A) $(-\infty, -1) \cup (-1, \infty)$ B) $(-\infty, -1) \cup (-1, 7) \cup (7, \infty)$

C) $(-\infty, \infty)$ D) $(-\infty, 7) \cup (7, \infty)$

2 Combine Functions Using the Algebra of Functions, Specifying Domains

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Given functions f and g, perform the indicated operations.

1) $f(x) = 3x - 4$, $g(x) = 8x - 3$
Find $f - g$.

A) $5x + 1$ B) $-5x - 7$ C) $-5x - 1$ D) $11x - 7$

2) $f(x) = 8x^2 - 7x$, $g(x) = x^2 - 5x - 14$
Find $\frac{f}{g}$.

A) $\frac{8x - 7}{-5}$ B) $\frac{8x}{x + 1}$ C) $\frac{8x^2 - 7x}{x^2 - 5x - 14}$ D) $\frac{8 - x}{14}$

3) $f(x) = 9 - 9x$, $g(x) = -2x + 9$
Find $f + g$.

A) $7x$ B) $-11x + 18$ C) $-7x + 18$ D) $-2x + 9$

4) $f(x) = \sqrt{2x + 2}$, $g(x) = \sqrt{9x - 4}$
Find fg.

A) $(2x + 2)(3x - 2)$ B) $(2x + 2)(9x - 4)$ C) $(\sqrt{2x + 2})(\sqrt{9x - 4})$ D) $(3x - 2)(\sqrt{2x + 2})$

5) $f(x) = 7x + 8$, $g(x) = 9x - 3$
Find fg.

A) $63x^2 - 24$ B) $63x^2 + 51x - 24$ C) $63x^2 + 69x - 24$ D) $16x^2 + 51x + 5$

Given functions f and g, determine the domain of f + g.

6) $f(x) = 4x + 10$, $g(x) = 2x - 6$

A) $(0, \infty)$ B) $(-\infty, 0) \cup (0, \infty)$ C) $(-\infty, \infty)$ D) $(-\infty, -4) \cup (-4, \infty)$

7) $f(x) = 3x + 9$, $g(x) = \frac{2}{x - 3}$

A) $(0, \infty)$ B) $(-\infty, 3) \cup (3, \infty)$ C) $(-\infty, -2) \cup (-2, \infty)$ D) $(-\infty, \infty)$

8) $f(x) = 5x - 5$, $g(x) = \frac{4}{x + 10}$

A) $(-\infty, -10) \cup (-10, \infty)$ B) $(-\infty, -4) \cup (-4, \infty)$

C) $(0, \infty)$ D) $(-\infty, \infty)$

9) $f(x) = \frac{2x}{x - 10}, \quad g(x) = \frac{4}{x + 3}$

A) $(-\infty, \infty)$

B) $(-\infty, -4) \cup (-4, -2) \cup (-2, \infty)$

C) $(-\infty, -3) \cup (-3, 10) \cup (10, \infty)$

D) $(-\infty, -10) \cup (-10, 3) \cup (3, \infty)$

10) $f(x) = 3x^2 + 2, \quad g(x) = 2x^3 + 3$

A) $(0, \infty)$

B) $(-\infty, 0) \cup (0, \infty)$

C) $(-\infty, \infty)$

D) $(-\infty, -3) \cup (-3, -2) \cup (-2, \infty)$

Find the domain of the indicated combined function.

11) Find the domain of $(f - g)(x)$ when $f(x) = 8x - 9$ and $g(x) = 3x - 4$.

A) Domain: $(-\infty, \infty)$ B) Domain: $(-9, 8)$ C) Domain: $(-9, \infty)$ D) Domain: $(-8, 9)$

12) Find the domain of $(fg)(x)$ when $f(x) = \sqrt{3x + 9}$ and $g(x) = \sqrt{9x - 4}$.

A) Domain: $\left[\frac{4}{9}, \infty\right)$ B) Domain: $[0, \infty)$ C) Domain: $\left[-\frac{4}{9}, \infty\right)$ D) Domain: $(-\infty, \infty)$

13) Find the domain of $\left(\frac{f}{g}\right)(x)$ when $f(x) = 8x^2 - 9x$ and $g(x) = x^2 - 4x - 6$.

A) Domain: $\left(-\infty, 2 - \sqrt{10}\right) \cup \left(2 - \sqrt{10}, \infty\right)$

B) Domain: $\left(-\infty, 2 - \sqrt{10}\right) \cup \left(2 - \sqrt{10}, 2 + \sqrt{10}\right) \cup \left(2 + \sqrt{10}, \infty\right)$

C) Domain: $(-\infty, \infty)$

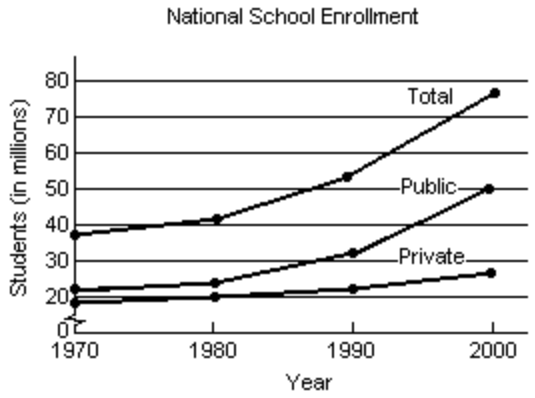
D) Domain: $\left(-\infty, 2 - \sqrt{10}\right) \cap \left(2 - \sqrt{10}, 2 + \sqrt{10}\right) \cap \left(2 - \sqrt{10}, \infty\right)$

14) Find the domain of $(f + g)(x)$ when $f(x) = 5 - 2x$ and $g(x) = -5x + 5$.

A) Domain: $(-\infty, \infty)$ B) Domain: $(-\infty, 5)$ C) Domain: $(-5, 2)$ D) Domain: $(-2, \infty)$

Solve the problem.

15) The following graph shows the private, public and total national school enrollment for students for select years from 1970 through 2000.



i) How is the graph for total school enrollment, T, determined from the graph of the private enrollment, r, and the public enrollment, u?
ii) During which 10–year period did the total number of students enrolled increase the least?
iii) During which 10–year period did the total number of students enrolled increase the most?

A) i) T is the difference of r and u.
ii) 1970 – 1980
iii) 1990–2000

B) i) T is the sum of r and u.
ii) 1970 – 1980
iii) 1990–2000

C) i) T is the sum of r and u.
ii) 1990–2000
iii) 1970–1980

D) i) T is the sum of r and u.
ii) 1970 – 1980
iii) 1980–1990

16) A firm is considering a new product. The accounting department estimates that the total cost, C(x), of producing x units will be
$C(x) = 55x + 3800$.
The sales department estimates that the revenue, R(x), from selling x units will be
$R(x) = 65x$,
but that no more than 607 units can be sold at that price. Find and interpret $(R - C)(607)$.

A) $2270 profit, income exceeds cost
It is worth it to develop product.

B) –$2270 loss, cost exceeds income
It is not worth it to develop product.

C) $987 profit, income exceeds cost
It is worth it to develop product.

D) $76,640 profit, income exceeds cost
It is worth it to develop product.

17) The function $f(t) = -0.14t^2 + 0.52t + 30.7$ models the U.S. population in millions, ages 65 and older, where t represents years after 1990. The function $g(t) = 0.52t^2 + 11.04t + 107.8$ models the total yearly cost of Medicare in billions of dollars, where t represents years after 1990. What does the function $\frac{g}{f}$ represent? Find $\frac{g}{f}(5)$.

A) Cost per person in thousands of dollars. $11.18 thousand

B) Cost per person in thousands of dollars. $0.21 thousand

C) Cost per person in thousands of dollars. $0.17 thousand

D) Cost per person in thousands of dollars. $5.91 thousand

3 Form Composite Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

For the given functions f and g , find the indicated composition.

1) $f(x) = 12x^2 - 3x$, $g(x) = 17x - 6$
$(f \circ g)(4)$

A) 42,888 B) 3054 C) 45,942 D) 11,160

2) $f(x) = x^2 + 2x + 1$, $g(x) = x^2 - 2x - 3$
$(f \circ g)(-4)$

A) 124 B) 484 C) 64 D) 424

3) $f(x) = 4x + 13$, $g(x) = 2x - 1$
$(f \circ g)(x)$

A) $8x + 25$ B) $8x + 9$ C) $8x + 12$ D) $8x + 17$

4) $f(x) = -6x + 3$, $g(x) = 2x + 3$
$(g \circ f)(x)$

A) $12x + 9$ B) $-12x + 21$ C) $-12x - 3$ D) $-12x + 9$

5) $f(x) = \dfrac{8}{x - 8}$, $g(x) = \dfrac{8}{3x}$
$(f \circ g)(x)$

A) $\dfrac{8x - 64}{24x}$ B) $\dfrac{24x}{8 - 24x}$ C) $\dfrac{24x}{8 + 24x}$ D) $\dfrac{8x}{8 - 24x}$

6) $f(x) = \dfrac{x - 6}{7}$, $g(x) = 7x + 6$
$(g \circ f)(x)$

A) $x + 12$ B) $x - \dfrac{6}{7}$ C) x D) $7x + 36$

7) $f(x) = 4x^2 + 3x + 5$, $g(x) = 3x - 7$
$(g \circ f)(x)$

A) $12x^2 + 9x + 22$ B) $4x^2 + 9x + 8$ C) $4x^2 + 3x - 2$ D) $12x^2 + 9x + 8$

4 Determine Domains for Composite Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the domain of the composite function $f \circ g$.

1) $f(x) = 4x + 36$, $g(x) = x + 2$

A) $(-\infty, 11) \cup (11, \infty)$ B) $(-\infty, -9) \cup (-9, -2) \cup (-2, \infty)$
C) $(-\infty, -11) \cup (-11, \infty)$ D) $(-\infty, \infty)$

2) $f(x) = \frac{10}{x + 10}$, $g(x) = x + 7$

A) $(-\infty, -10) \cup (-10, -7) \cup (-7, \infty)$
B) $(-\infty, -10) \cup (-10, \infty)$
C) $(-\infty, \infty)$
D) $(-\infty, -17) \cup (-17, \infty)$

3) $f(x) = x + 5$, $g(x) = \frac{2}{x + 7}$

A) $(-\infty, \infty)$
B) $(-\infty, -7) \cup (-7, -5) \cup (-5, \infty)$
C) $(-\infty, -12) \cup (-12, \infty)$
D) $(-\infty, -7) \cup (-7, \infty)$

4) $f(x) = \frac{2}{x + 10}$, $g(x) = \frac{80}{x}$

A) $(-\infty, -10) \cup (-10, 0) \cup (0, -8) \cup (-8, \infty)$
B) $(-\infty, -10) \cup (-10, -8) \cup (-8, \infty)$
C) $(-\infty, -8) \cup (-8, 0) \cup (0, \infty)$
D) $(-\infty, \infty)$

5) $f(x) = \sqrt{x}$; $g(x) = 2x + 12$

A) $[-6, \infty)$
B) $[0, \infty)$
C) $(-\infty, \infty)$
D) $(-\infty, -6] \cup [0, \infty)$

6) $f(x) = 5x + 15$; $g(x) = \sqrt{x}$

A) $(-\infty, -3] \cup [0, \infty)$
B) $(-\infty, \infty)$
C) $[-3, \infty)$
D) $[0, \infty)$

5 Write Functions as Compositions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find functions f and g so that h(x) = (f ∘ g)(x).

1) $h(x) = \frac{1}{x^2 - 8}$

A) $f(x) = 1/8$, $g(x) = x^2 - 8$
B) $f(x) = 1/x$, $g(x) = x^2 - 8$
C) $f(x) = 1/x^2$, $g(x) = -1/8$
D) $f(x) = 1/x^2$, $g(x) = x - 8$

2) $h(x) = |4x + 2|$

A) $f(x) = |-x|$, $g(x) = 4x - 2$
B) $f(x) = |x|$, $g(x) = 4x + 2$
C) $f(x) = x$, $g(x) = 4x + 2$
D) $f(x) = -|x|$, $g(x) = 4x + 2$

3) $h(x) = \frac{5}{x^2} + 9$

A) $f(x) = 5/x^2$, $g(x) = 9$
B) $f(x) = x + 9$, $g(x) = 5/x^2$
C) $f(x) = 1/x$, $g(x) = 5/x + 9$
D) $f(x) = x$, $g(x) = 5/x + 9$

4) $h(x) = \frac{6}{\sqrt{9x + 7}}$

A) $f(x) = 6$, $g(x) = \sqrt{9 + 7}$
B) $f(x) = 6/\sqrt{x}$, $g(x) = 9x + 7$
C) $f(x) = 6/x$, $g(x) = 9x + 7$
D) $f(x) = \sqrt{9x + 7}$, $g(x) = 6$

5) $h(x) = (-5x + 18)^2$

A) $f(x) = -5x^2$, $g(x) = x + 18$

B) $f(x) = -5x + 18$, $g(x) = x^2$

C) $f(x) = (-5x)^2$, $g(x) = 18$

D) $f(x) = x^2$, $g(x) = -5x + 18$

6) $h(x) = \sqrt{27x^2 + 27}$

A) $f(x) = \sqrt{27x^2}$, $g(x) = \sqrt{27}$

B) $f(x) = \sqrt{27x + 27}$, $g(x) = x^2$

C) $f(x) = 27x^2 + 27$, $g(x) = \sqrt{x}$

D) $f(x) = \sqrt{x}$, $g(x) = 27x^2 + 27$

1.8 Inverse Functions

1 Verify Inverse Functions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine which two functions are inverses of each other.

1) $f(x) = 8x$ $g(x) = \frac{x}{8}$ $h(x) = \frac{8}{x}$

A) None B) g(x) and h(x) C) f(x) and g(x) D) f(x) and h(x)

2) $f(x) = \sqrt{x}$ $g(x) = \frac{1}{\sqrt{x}}$ $h(x) = x^2$

A) f(x) and g(x) B) g(x) and h(x) C) f(x) and h(x) D) None

3) $f(x) = \frac{x + 2}{4}$ $g(x) = 4x + 2$ $h(x) = \frac{x - 2}{4}$

A) f(x) and g(x) B) None C) f(x) and h(x) D) g(x) and h(x)

4) $f(x) = \frac{x + 6}{3}$ $g(x) = 3x + 6$ $h(x) = \frac{x - 3}{6}$

A) f(x) and h(x) B) f(x) and g(x) C) g(x) and h(x) D) None

5) $f(x) = x^3 - 5$ $g(x) = \sqrt[3]{x - 5}$ $h(x) = x^3 + 5$

A) f(x) and g(x) B) g(x) and h(x) C) None D) f(x) and h(x)

2 Find the Inverse of a Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the inverse of the one–to–one function.

1) $f(x) = 8x + 8$

A) $f^{-1}(x) = \frac{x - 8}{8}$ B) $f^{-1}(x) = \frac{8x - 8}{8}$ C) $f^{-1}(x) = \frac{y - 8}{8}$ D) $f^{-1}(x) = \frac{x + 8}{8}$

2) $f(x) = \frac{3x - 2}{5}$

A) $f^{-1}(x) = \frac{5x + 2}{3}$ B) $f^{-1}(x) = \frac{5}{3x + 2}$ C) $f^{-1}(x) = \frac{5}{3x - 2}$ D) $f^{-1}(x) = \frac{5x - 2}{3}$

3) $f(x) = \dfrac{7}{3x + 1}$

A) $f^{-1}(x) = \dfrac{3x + 1}{7}$ B) $f^{-1}(x) = \dfrac{1}{3} - \dfrac{7}{3x}$ C) $f^{-1}(x) = \dfrac{7}{3x} - \dfrac{1}{3}$ D) $f^{-1}(x) = \dfrac{7}{3y} - \dfrac{1}{3}$

4) $f(x) = (x + 5)^3$

A) $f^{-1}(x) = \sqrt[3]{x} + 5$ B) $f^{-1}(x) = \sqrt[3]{x} - 125$ C) $f^{-1}(x) = \sqrt{x} - 5$ D) $f^{-1}(x) = \sqrt[3]{x} - 5$

5) $f(x) = \sqrt{x + 2}$

A) $f^{-1}(x) = x^2 + 2$ B) $f^{-1}(x) = x^2 - 2$ C) $f^{-1}(x) = \dfrac{1}{x^2 - 2}$ D) $f^{-1}(x) = x - 2$

6) $f(x) = \sqrt[3]{x - 8}$

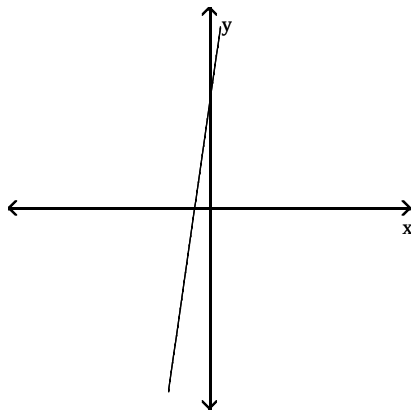
A) $f^{-1}(x) = x + 8$ B) $f^{-1}(x) = x^3 + 64$ C) $f^{-1}(x) = \dfrac{1}{x^3 + 8}$ D) $f^{-1}(x) = x^3 + 8$

3 Use the Horizontal Line Test to Determine if a Function has an Inverse Function

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

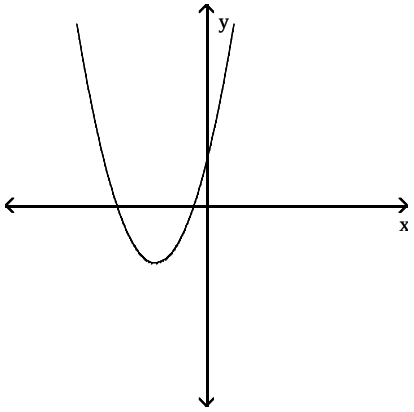
Does the graph represent a function that has an inverse function?

1)



A) Yes B) No

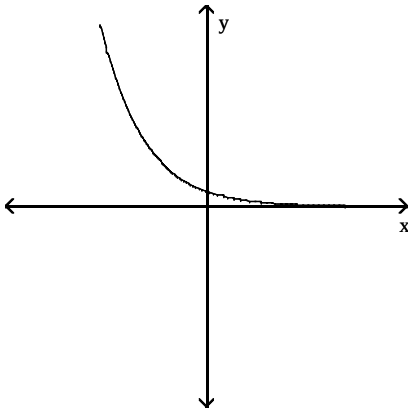
2)



A) No

B) Yes

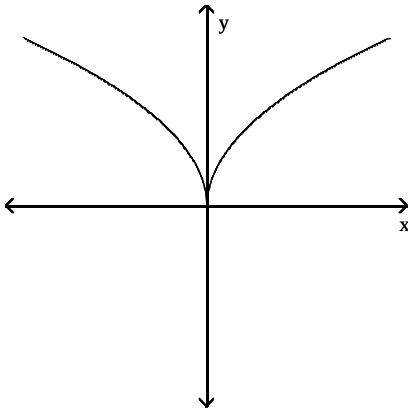
3)



A) No

B) Yes

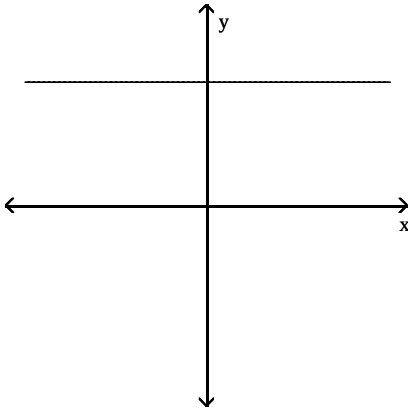
4)



A) No

B) Yes

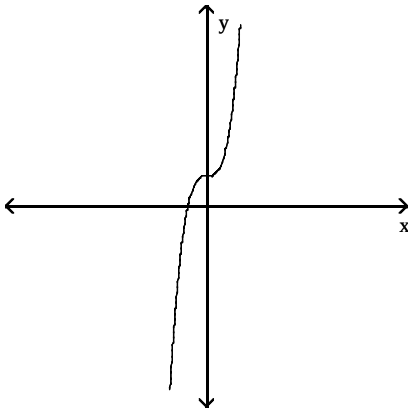
5)



A) No

B) Yes

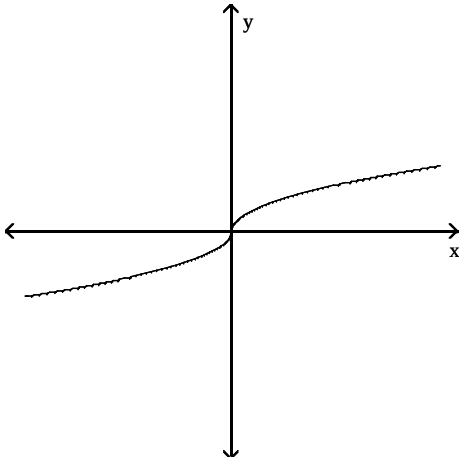
6)



A) No

B) Yes

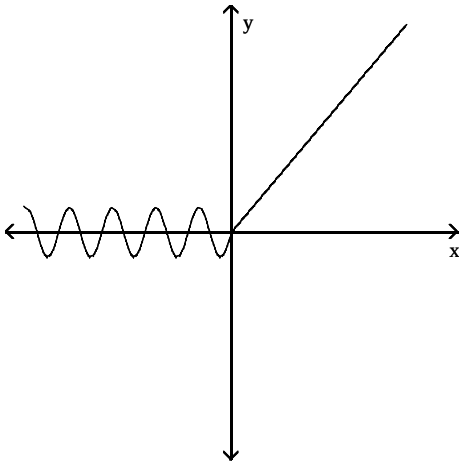
7)



A) Yes

B) No

8)



A) Yes

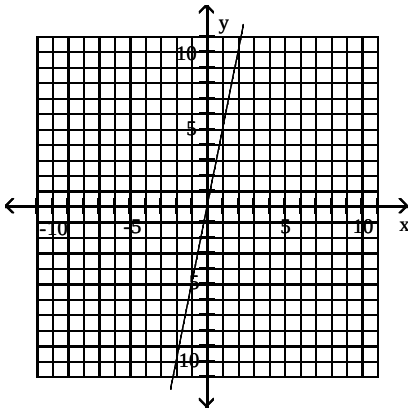
B) No

4 Use the Graph of a One–to–One Function to Graph Its Inverse Function

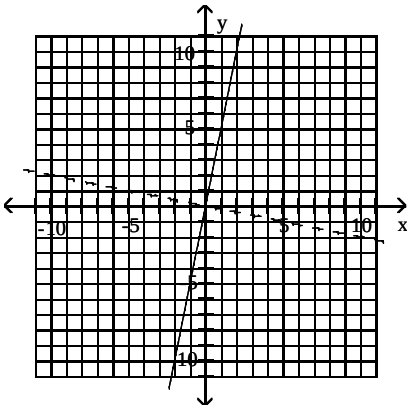
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the graph of f to draw the graph of its inverse function.

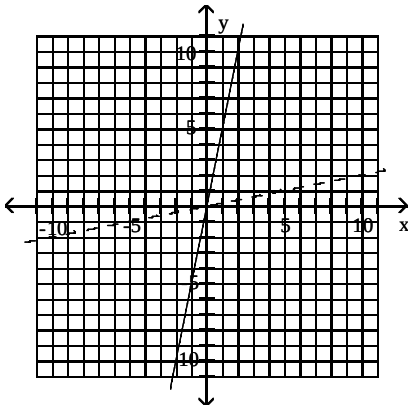
1)



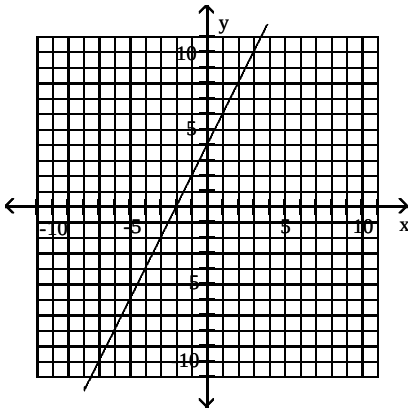
A)



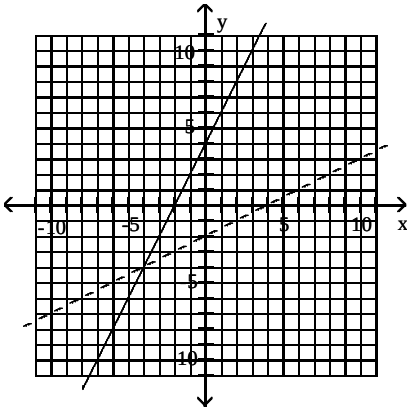
B)



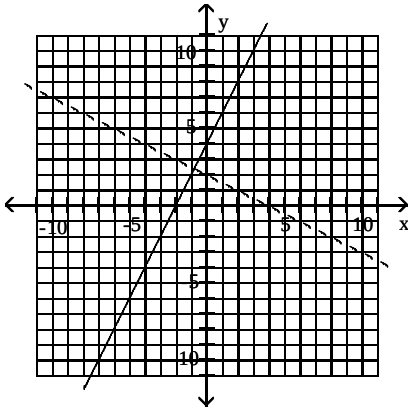
2)



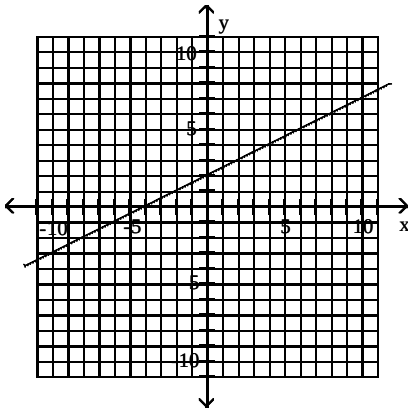
A)



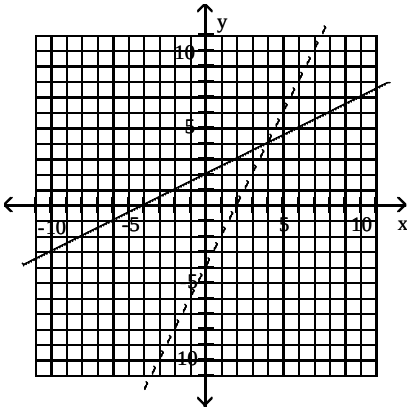
B)



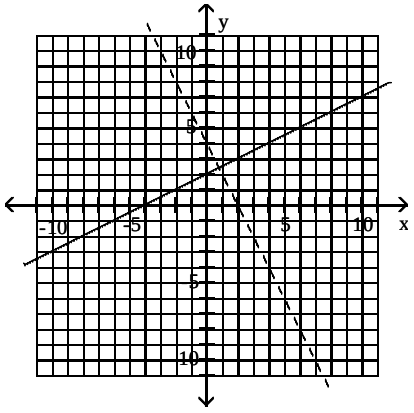
3)



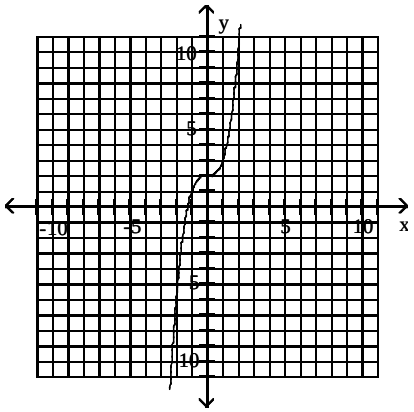
A)



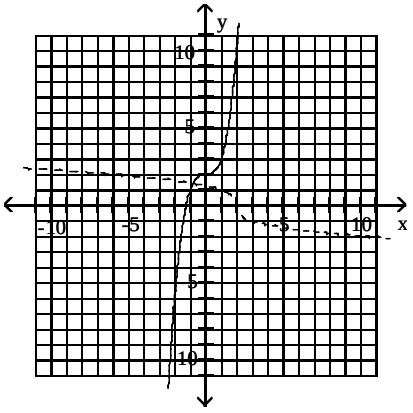
B)



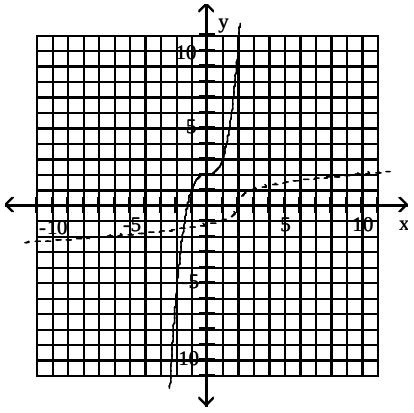
4)



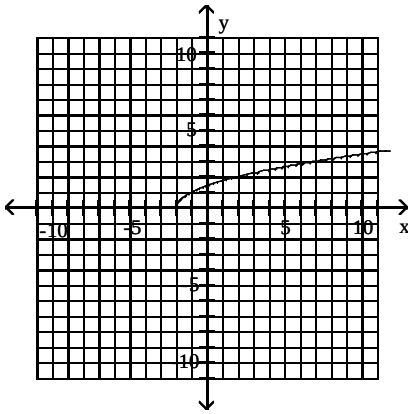
A)



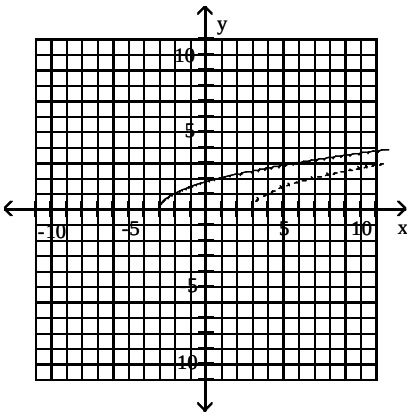
B)



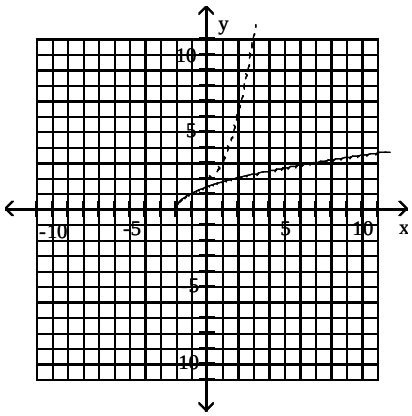
5)


y
10
5
-10
-5
5
10
x
5
10

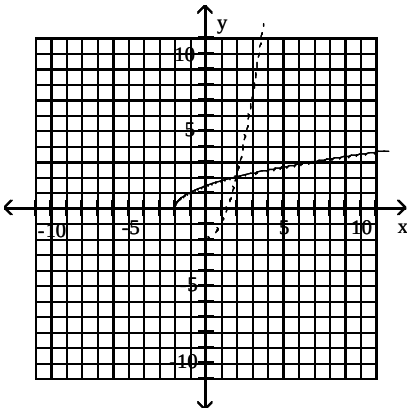
A)


y
10
5
-10
-5
5
10
x
5
10

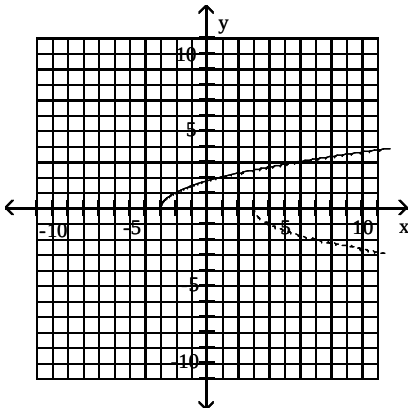
B)


y
10
5
-10
-5
5
10
x
5
10

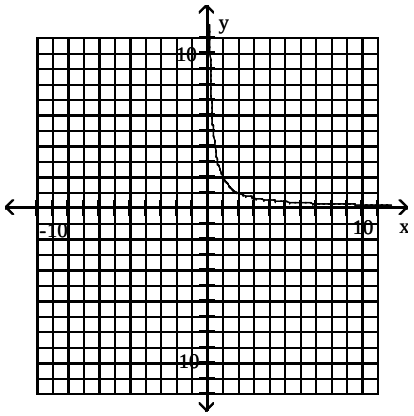
C)


y
10
5
-10
-5
5
10
x
5
10

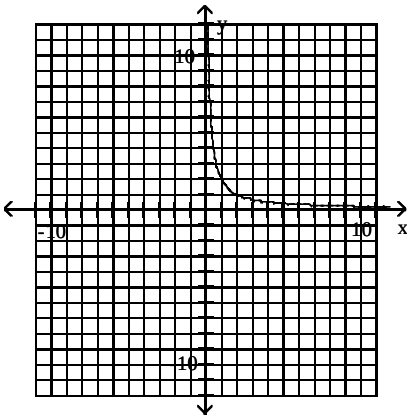
D)


y
10
5
-10
-5
5
10
x
5
10

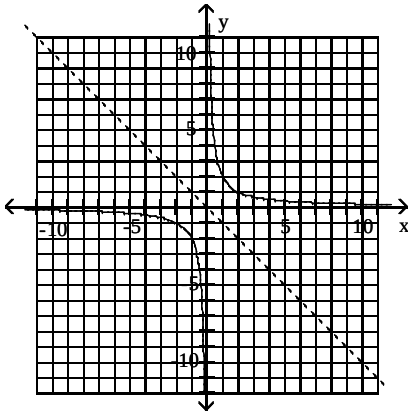
6)


y
10
-10
10
x
-10

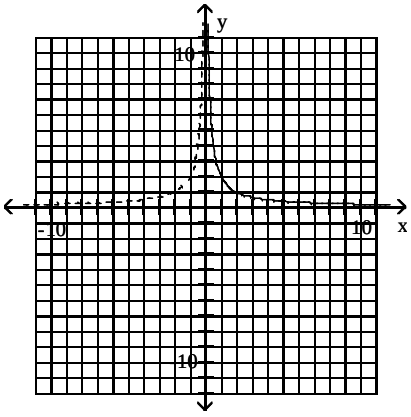
A)


y
10
-10
10
x
-10

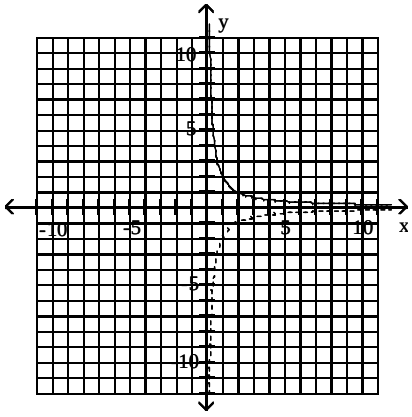
B)


y
10
5
-10
-5
5
10
x
-5
-10

C)


y
10
-10
10
x
-10

D)

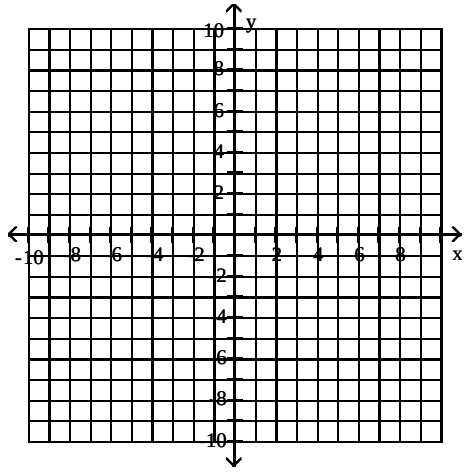

y
10
5
-10
-5
5
10
x
-5
-10

5 Find the Inverse of a Function and Graph Both Functions on the Same Axes

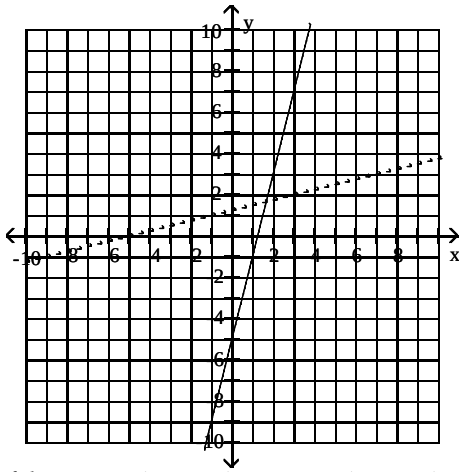
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Graph f as a solid line and f^{-1} as a dashed line in the same rectangular coordinate space. Use interval notation to give the domain and range of f and f^{-1}.

1) f(x) = 4x – 5



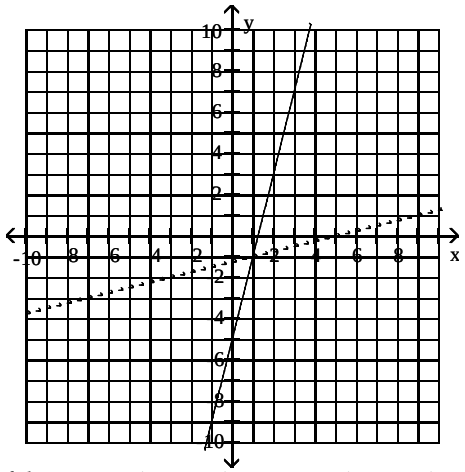
A)



f domain = (–10, 10); range = (–10, 10)

f^{-1} domain = (–10, 10); range = (–10, 10)

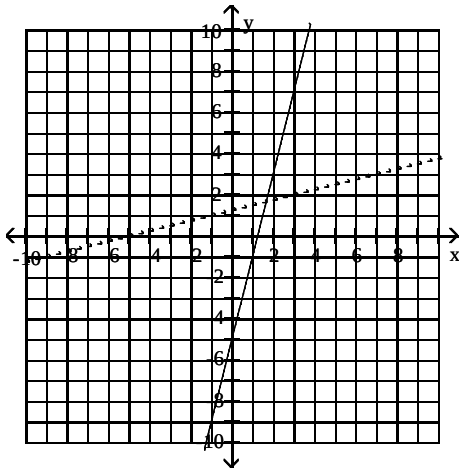
B)



f domain = (–10, 10); range = (–10, 10)

f^{-1} domain = (–10, 10); range = (–10, 10)

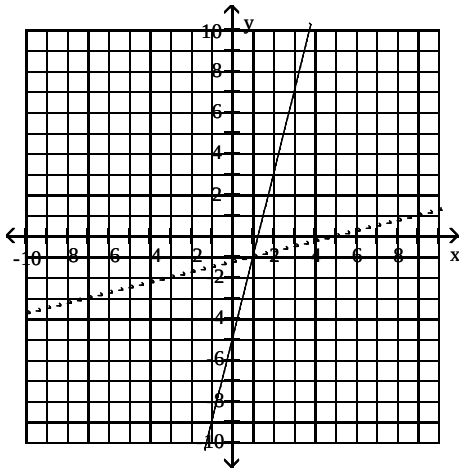
C)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

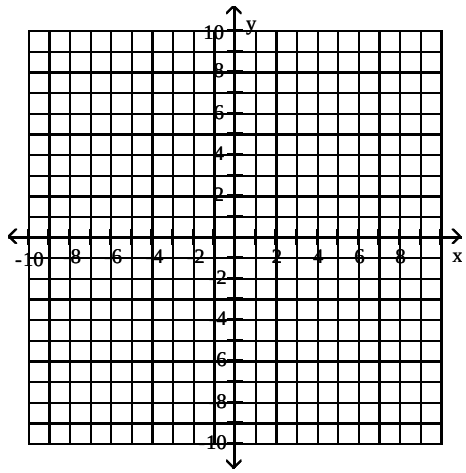
D)



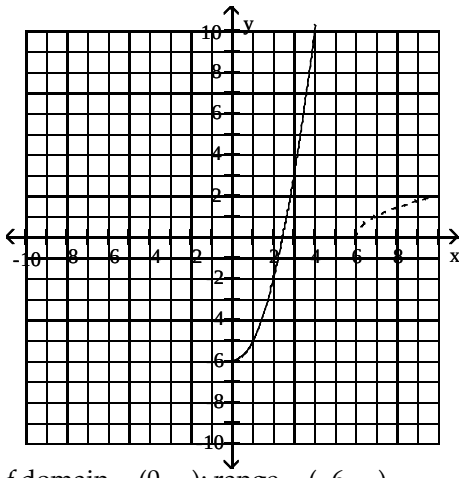
f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

2) $f(x) = x^2 - 6, x \geq 0$



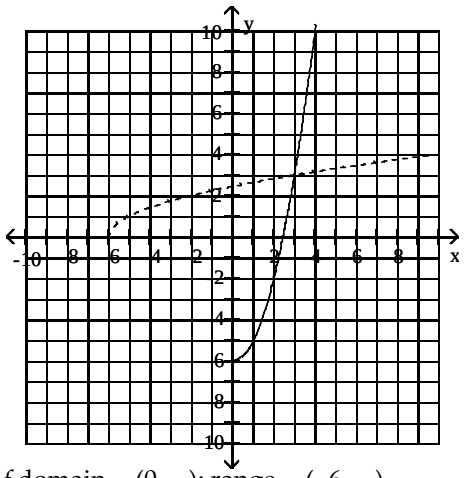
A)



f domain = $(0, \infty)$; range = $(-6, \infty)$

f^{-1} domain = $(0, \infty)$; range = $(6, \infty)$

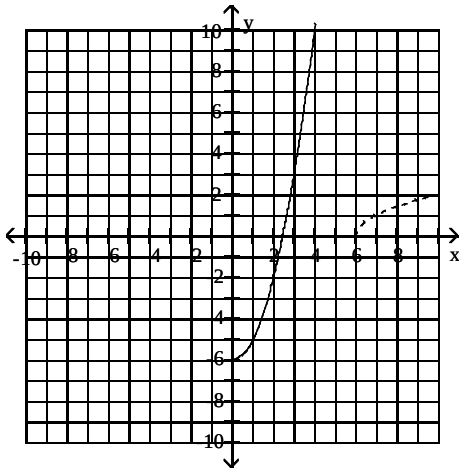
B)



f domain = $(0, \infty)$; range = $(-6, \infty)$

f^{-1} domain = $(0, \infty)$; range = $(-6, \infty)$

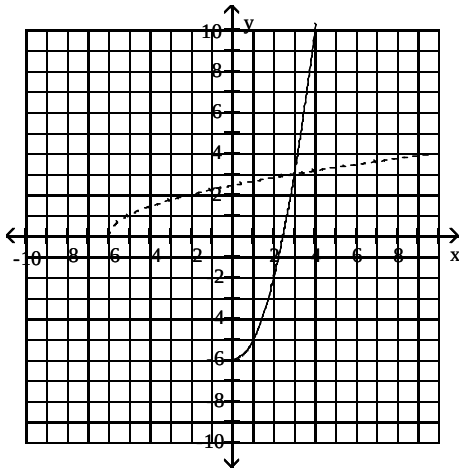
C)



f domain = $(-\infty, \infty)$; range = $(-6, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(6, \infty)$

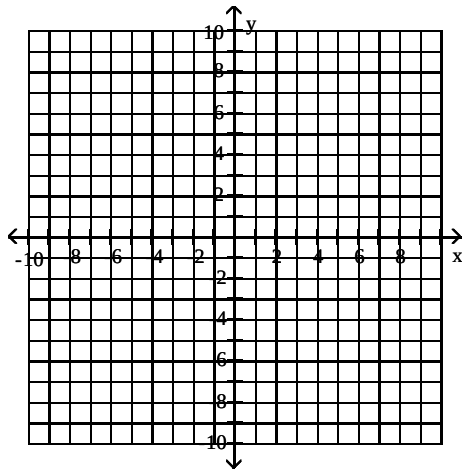
D)



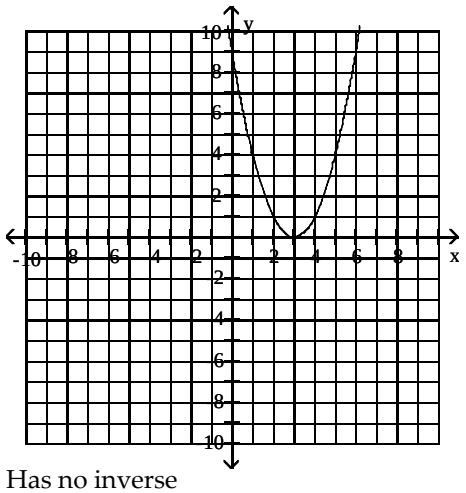
f domain = $(-\infty, \infty)$; range = $(-6, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-6, \infty)$

3) $f(x) = (x - 3)^2$, $x \geq 3$



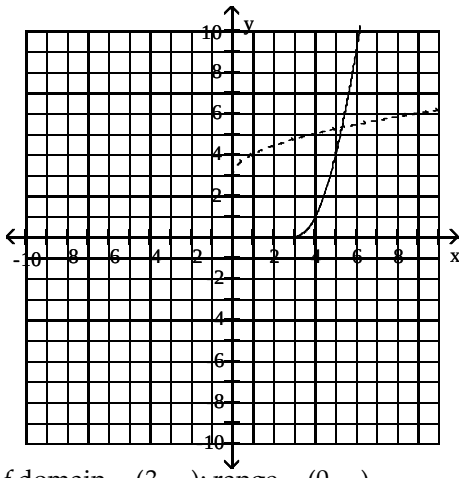
A)



Has no inverse

f domain = $(-\infty, \infty)$; range = $(0, \infty)$

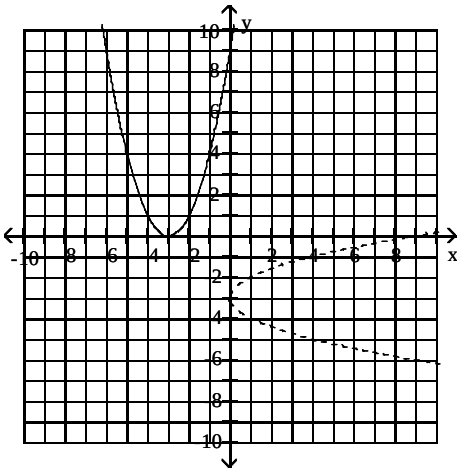
B)



f domain = $(3, \infty)$; range = $(0, \infty)$

f^{-1} domain = $(0, \infty)$; range = $(3, \infty)$

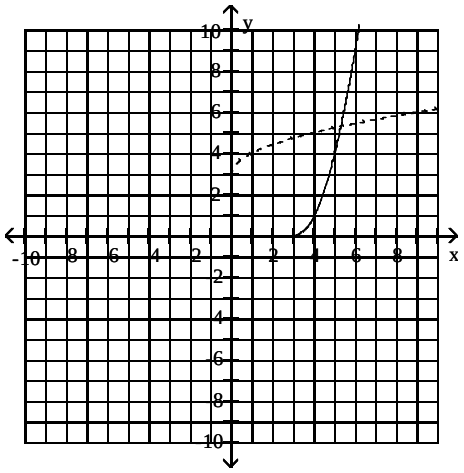
C)



f domain = $(-\infty, \infty)$; range = $(0, \infty)$

f^{-1} domain = $(0, \infty)$; range = $(-\infty, \infty)$

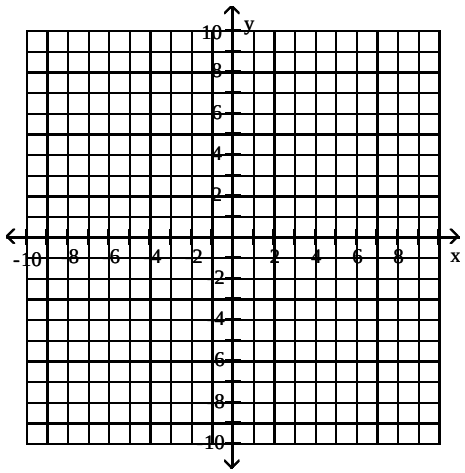
D)



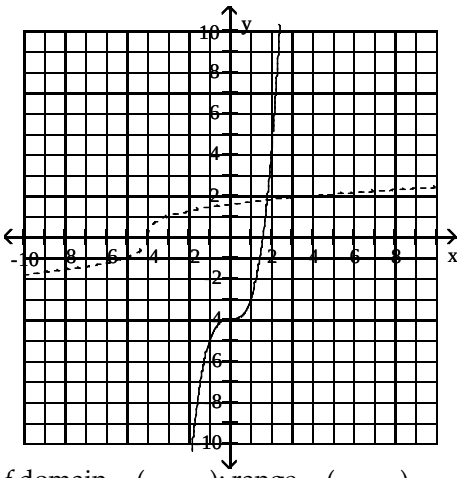
f domain = $(-\infty, \infty)$; range = $(0, \infty)$

f^{-1} domain = $(0, \infty)$; range = $(-\infty, \infty)$

4) $f(x) = x^3 - 4$



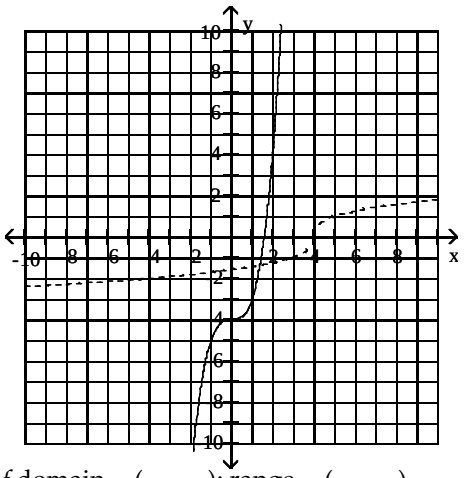
A)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

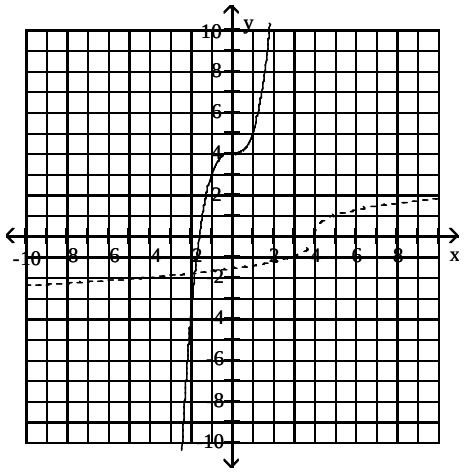
B)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

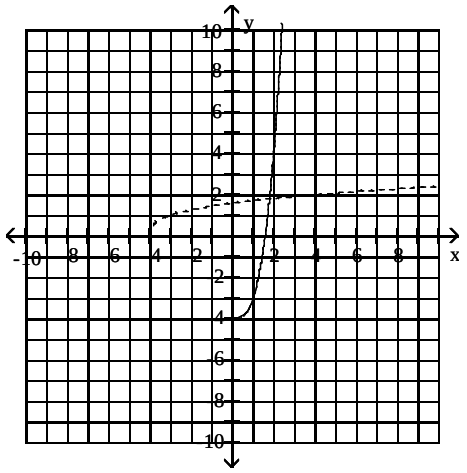
C)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

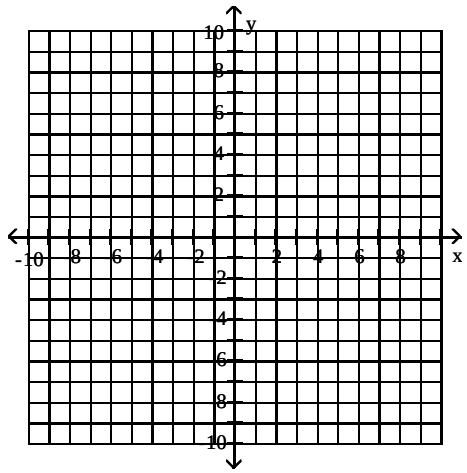
D)



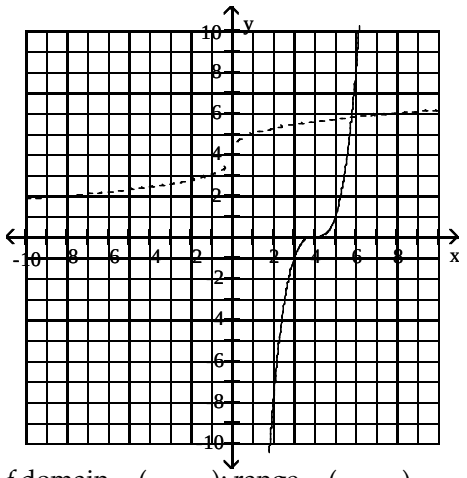
f domain = $(0, \infty)$; range = $(-4, \infty)$

f^{-1} domain = $(-4, \infty)$; range = $(0, \infty)$

5) $f(x) = (x + 4)^3$



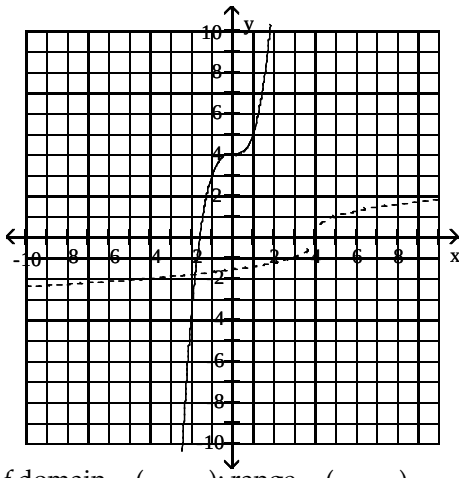
A)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

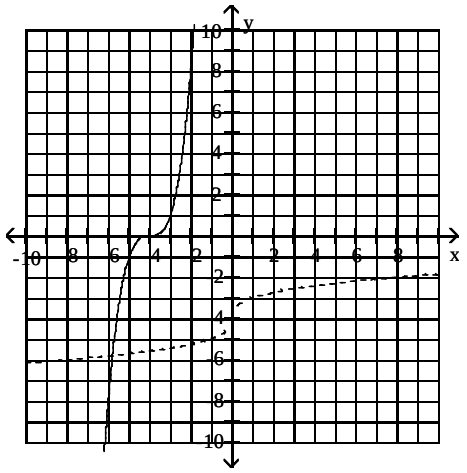
B)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

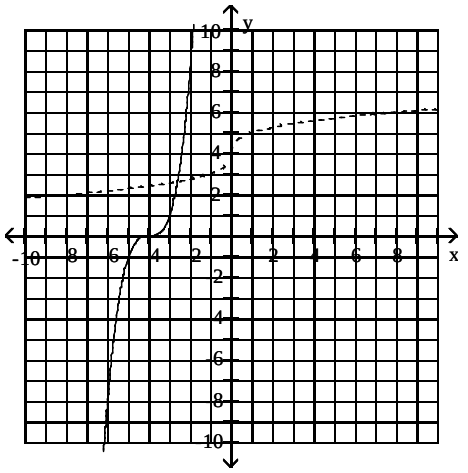
C)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

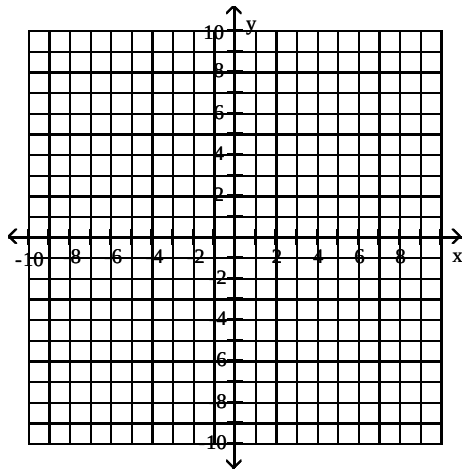
D)



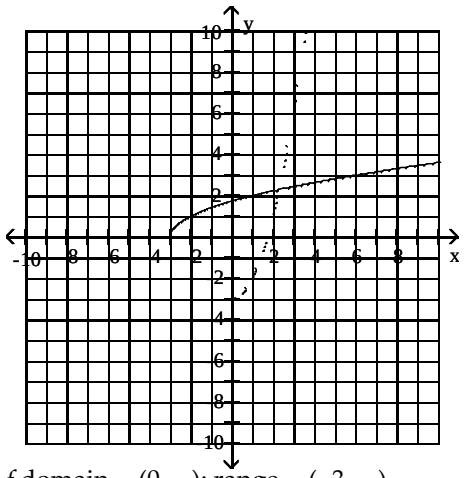
f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

6) $f(x) = \sqrt{x - 3}$



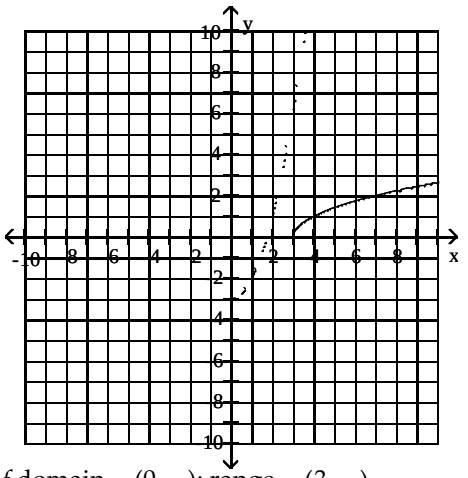
A)



f domain = $(0, \infty)$; range = $(-3, \infty)$

f^{-1} domain = $(-3, \infty)$; range = $(0, \infty)$

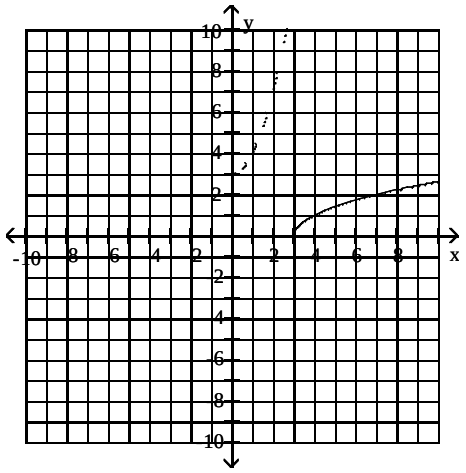
B)



f domain = $(0, \infty)$; range = $(3, \infty)$

f^{-1} domain = $(-3, \infty)$; range = $(0, \infty)$

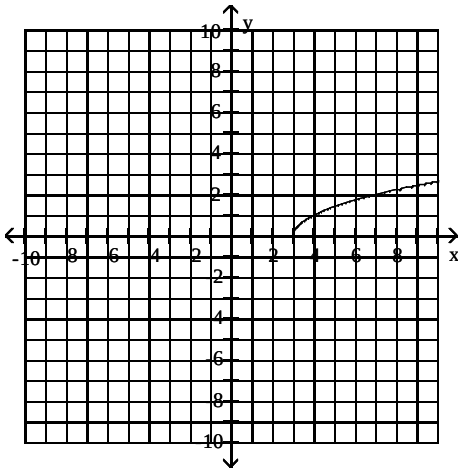
C)



f domain = (0, ∞); range = (3, ∞)

f^{-1} domain = (3, ∞); range = (0, ∞)

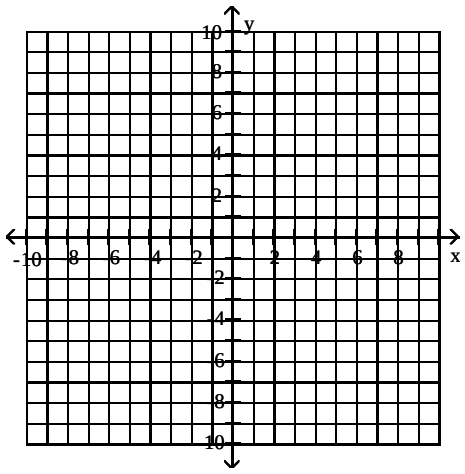
D)



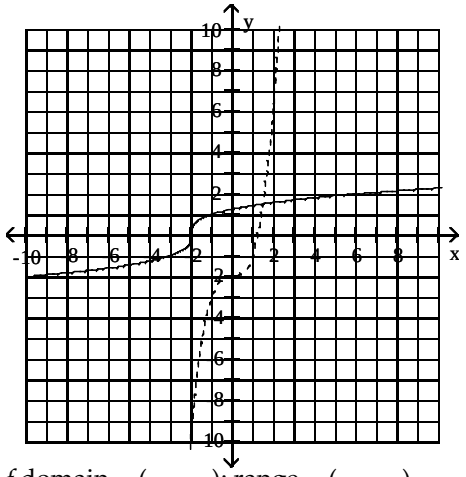
f domain = (0, ∞); range = (3, ∞)

f^{-1} Has no inverse.

7) $f(x) = \sqrt[3]{x} + 2$



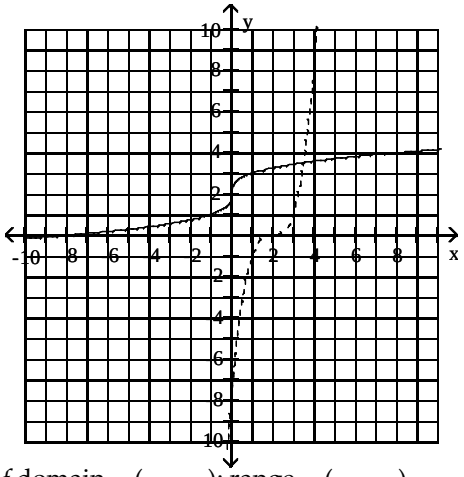
A)



f domain = (−∞, ∞); range = (−∞, ∞)

f^{-1} domain = (−∞, ∞); range = (−∞, ∞)

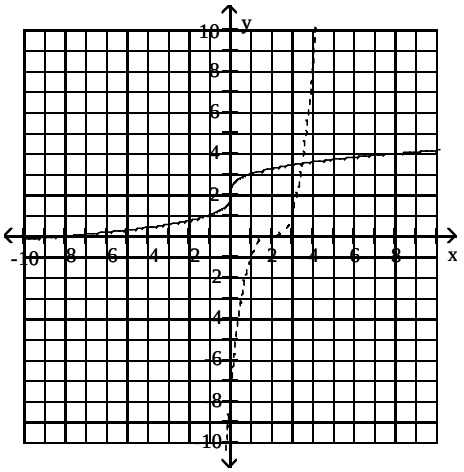
B)



f domain = (−∞, ∞); range = (−∞, ∞)

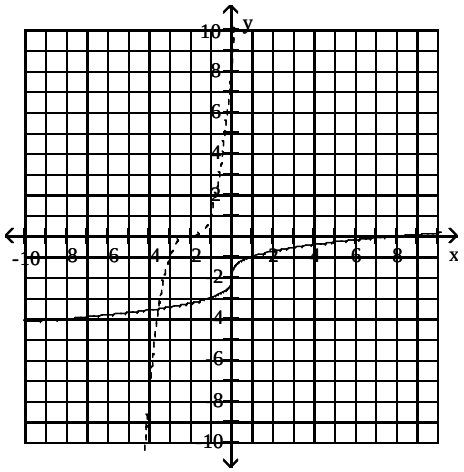
f^{-1} domain = (−∞, ∞); range = (−∞, ∞)

C)



f domain = $(-\infty, \infty)$; range = $(0, \infty)$
f^{-1} domain = $(0, \infty)$; range = $(-\infty, \infty)$

D)



f domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$
f^{-1} domain = $(-\infty, \infty)$; range = $(-\infty, \infty)$

1.9 Distance and Midpoint Formulas; Circles

1 Find the Distance Between Two Points

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the distance between the pair of points.

1) (–2, 3) and (–5, 7)

A) 5 B) 25 C) 6 D) 10

2) (4, 4) and (–5, –1)

A) $\sqrt{56}$ B) $\sqrt{106}$ C) 4 D) 45

3) (7, –5) and (5, –1)

A) 6 B) $2\sqrt{5}$ C) $12\sqrt{3}$ D) 12

4) (–6, –2) and (4, –4)

A) $2\sqrt{26}$ B) $96\sqrt{6}$ C) 12 D) 96

5) (–4, –3) and (–5, 4)

A) 8 B) $5\sqrt{2}$ C) 48 D) $48\sqrt{3}$

6) $(3\sqrt{13}, -4)$ and $(4\sqrt{13}, 2)$

A) 49 B) $\frac{49}{2}$ C) 7 D) 6

7) (0, 0) and (–8, 6)

A) $\sqrt{6}$ B) 10 C) 100 D) –2

8) (0, –10) and (6, –10)

A) 6 B) $2\sqrt{34}$ C) 36 D) 10

2 Find the Midpoint of a Line Segment

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the midpoint of the line segment whose end points are given.

1) (9, 7) and (2, 0)

A) (11, 7) B) (7, 7) C) $(\frac{11}{2}, \frac{7}{2})$ D) $(\frac{7}{2}, \frac{7}{2})$

2) (6, 9) and (–3, 1)

A) $(\frac{3}{2}, 5)$ B) $(\frac{9}{2}, 4)$ C) (3, 10) D) (9, 8)

3) $(\frac{7}{3}, \frac{5}{2})$ and (– 1, – 1)

A) $(\frac{5}{3}, \frac{7}{4})$ B) $(-\frac{5}{3}, -\frac{7}{4})$ C) $(\frac{2}{3}, \frac{3}{4})$ D) $(\frac{4}{3}, \frac{3}{2})$

4) $(7\sqrt{6}, -8\sqrt{2})$ and $(10\sqrt{6}, -5\sqrt{2})$

A) $(\frac{-3\sqrt{6}}{2}, \frac{-3\sqrt{2}}{2})$ B) $(\frac{17\sqrt{6}}{2}, \frac{-13\sqrt{2}}{2})$ C) $(\frac{3\sqrt{6}}{2}, \frac{3\sqrt{2}}{2})$ D) $(17\sqrt{6}, -13\sqrt{2})$

3 Write the Standard Form of a Circle's Equation

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Write the standard form of the equation of the circle with the given center and radius.

1) (–7, –4); 8

A) $(x - 7)^2 + (y - 4)^2 = 64$ B) $(x + 7)^2 + (y + 4)^2 = 64$

C) $(x + 4)^2 + (y + 7)^2 = 8$ D) $(x - 4)^2 + (y - 7)^2 = 8$

2) (–7, 0); 1

A) $x^2 + (y - 7)^2 = 1$ B) $(x + 7)^2 + y^2 = 1$ C) $(x - 7)^2 + y^2 = 1$ D) $x^2 + (y + 7)^2 = 1$

3) (0, –9); 8

A) $(x - 9)^2 + y^2 = 64$ B) $(x + 9)^2 + y^2 = 64$ C) $x^2 + (y - 9)^2 = 8$ D) $x^2 + (y + 9)^2 = 64$

4) (8, 3); $\sqrt{3}$

A) $(x - 8)^2 + (y - 3)^2 = 3$ B) $(x + 3)^2 + (y + 8)^2 = 9$

C) $(x - 3)^2 + (y - 8)^2 = 9$ D) $(x + 8)^2 + (y + 3)^2 = 3$

5) (0, 10); $\sqrt{6}$

A) $(x + 10)^2 + y^2 = 36$ B) $x^2 + (y - 10)^2 = 6$ C) $(x - 10)^2 + y^2 = 36$ D) $x^2 + (y + 10)^2 = 6$

6) (0, 0); 15

A) $x^2 + y^2 = 15$ B) $x^2 - y^2 = 15$ C) $x^2 + y^2 = 225$ D) $x^2 + y^2 = 30$

7) (0, 0); $2\sqrt{3}$

A) $x^2 + y^2 = 144$ B) $x^2 + y^2 = 12$ C) $x^2 + y^2 = 2\sqrt{3}$ D) $x^2 + y^2 = 6$

4 Give the Center and Radius of a Circle Whose Equation is in Standard Form

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

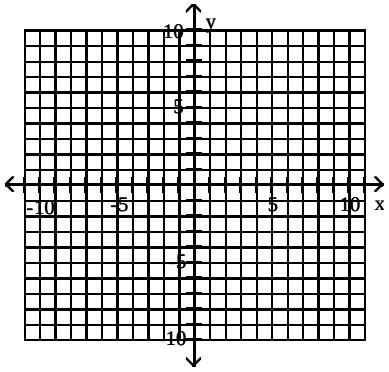
Find the center and the radius of the circle.

1) $(x - 6)^2 + (y - 2)^2 = 36$

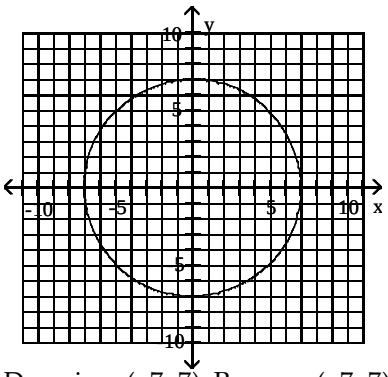
A) (–6, –2), r = 36 B) (–2, –6), r = 36 C) (6, 2), r = 6 D) (2, 6), r = 6

Graph the equation and state its domain and range. Use interval notation

2) $x^2 + y^2 = 49$

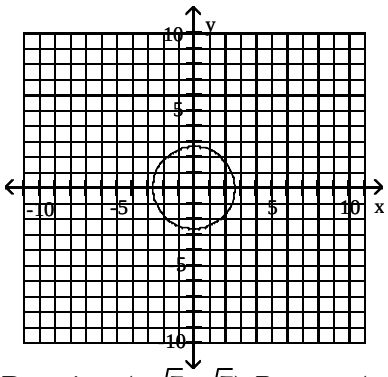


A)



Domain = (–7, 7); Range = (–7, 7)

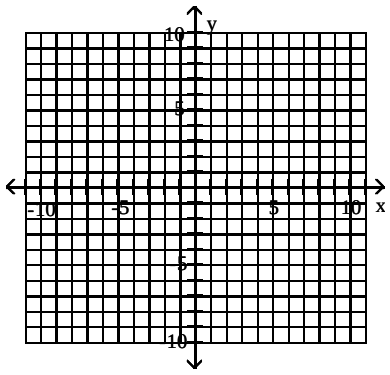
B)



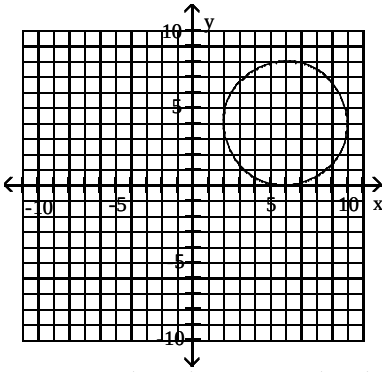
Domain = $(-\sqrt{7}, \sqrt{7})$; Range = $(-\sqrt{7}, \sqrt{7})$

Graph the equation.

3) $(x - 6)^2 + (y - 4)^2 = 16$

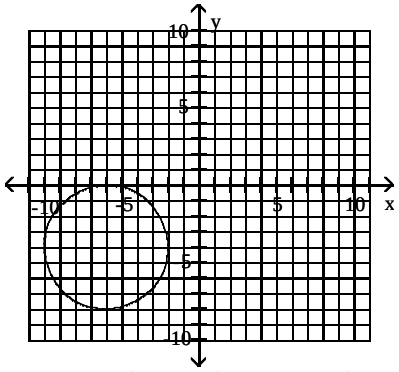


A)



Domain = (2, 10), Range = (0, 8)

B)



Domain = (–10, –2), Range = (–8, 0)

5 Convert the General Form of a Circle's Equation to Standard Form

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Complete the square and write the equation in standard form. Then give the center and radius of the circle.

1) $x^2 + 8x + 16 + y^2 + 4y + 4 = 49$

A) $(x + 4)^2 + (x + 2)^2 = 49$
(–4, –2), r = 7

B) $(x + 2)^2 + (x + 4)^2 = 49$
(–2, –4), r = 7

C) $(x + 2)^2 + (x + 4)^2 = 49$
(2, 4), r = 49

D) $(x + 4)^2 + (x + 2)^2 = 49$
(4, 2), r = 49

2) $x^2 + y^2 - 12x - 10y + 61 = 81$

A) $(x - 6)^2 + (x - 5)^2 = 81$
(–6, –5), r = 81

B) $(x - 6)^2 + (x - 5)^2 = 81$
(6, 5), r = 9

C) $(x - 5)^2 + (x - 6)^2 = 81$
(–5, –6), r = 81

D) $(x - 5)^2 + (x - 6)^2 = 81$
(5, 6), r = 9

3) $x^2 + y^2 - 2x + 16y = -49$

A) $(x + 8)^2 + (x - 1)^2 = 16$
(–8, 1), r = 4

B) $(x + 8)^2 + (x - 1)^2 = 16$
(8, –1), r = 16

C) $(x - 1)^2 + (x + 8)^2 = 16$
(–1, 8), r = 16

D) $(x - 1)^2 + (x + 8)^2 = 16$
(1, –8), r = 4

4) $3x^2 + 3y^2 = 9$

A) $x^2 + y^2 = 9$
(0, 0), r = 3

B) $x^2 + y^2 = 3$
(0, 0), r = 3

C) $(x - 3)^2 + (y - 3)^2 = 3$
(3, 3), r = $\sqrt{3}$

D) $x^2 + y^2 = 3$
(0, 0), r = $\sqrt{3}$

5) $x^2 + y^2 - 8x + 4y + 15 = 0$

A) $(x - 4)^2 + (y + 2)^2 = 5$
(–4, 2), r = $\sqrt{5}$

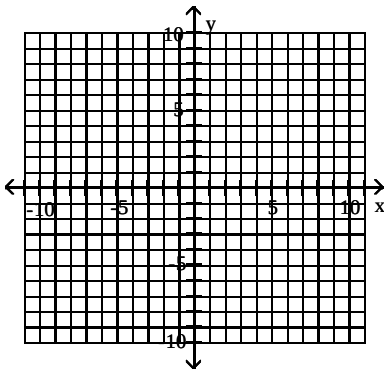
B) $(x + 4)^2 + (y - 2)^2 = 5$
(–4, 2), r = $\sqrt{5}$

C) $(x - 4)^2 + (y + 2)^2 = 5$
(4, –2), r = $\sqrt{5}$

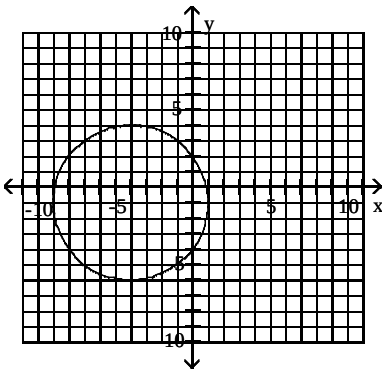
D) $(x - 4)^2 + (y + 2)^2 = 5$
(4, –2), r = 5

Graph the equation.

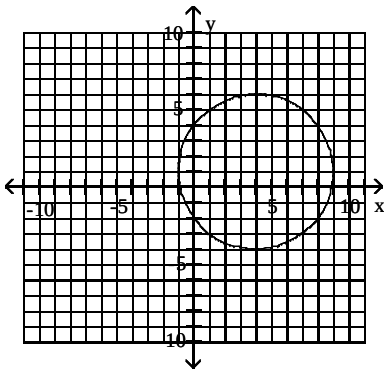
6) $x^2 + y^2 - 8x - 2y - 8 = 0$



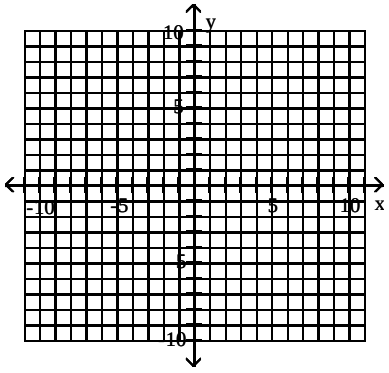
A)



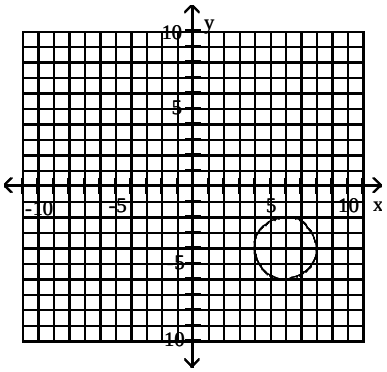
B)



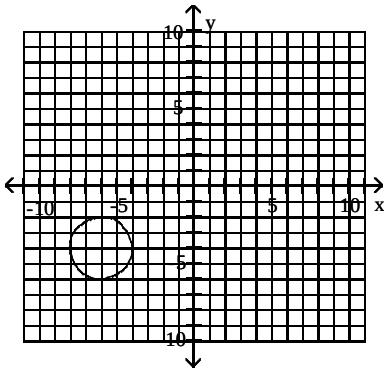
7) $x^2 + y^2 + 12x + 8y + 48 = 0$



A)



B)



1.10 Modeling with Functions

1 Construct Functions from Verbal Descriptions

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) The sum of two numbers is 34. Express the product of the numbers, P, as a function of one of the numbers, x.

A) $P(x) = (34 - x)^2$ B) $P(x) = (17 - x)^2$ C) $P(x) = 2(34 - x)$ D) $P(x) = x(34 - x)$

2) A car rental agency charges $220 per week plus $0.15 per mile to rent a car. Express the weekly cost to rent the car, f, as a function of the number of miles driven during the week, x.

A) $f(x) = 220x + 0.15$ B) $f(x) = 0.15x - 220$ C) $f(x) = 220.15$ D) $f(x) = 0.15x + 220$

3) According to a recent survey, in 2000, 61% of households had one or more pets. Throughout the the next decade, this decreased by approximately 2% per year. Express the percentage of households having pets, P, as a function of the number of years after 2000, x.

A) $P(x) = 0.02x + 0.61$ B) $P(x) = -0.02x + 61$

C) $P(x) = -0.02x + 0.61$ D) $P(x) = 0.61x - 0.02$

4) On a certain route, an airline carries 10,000 passengers per month, each paying $100. A market survey indicates that for each $1 decrease in the ticket price, the airline will gain 50 passengers.
a. Express the number of passengers per month, N, as a function of the ticket price, x.
b. Express the monthly revenue for the route, R, as a function of the ticket price, x.

A) a. $N(x) = 50x + 5000$
b. $R(x) = 50x^2 + 5000x$

B) a. $N(x) = -50x + 5000$
b. $R(x) = -50x^2 + 5000x$

C) a. $N(x) = -50x + 15{,}000$
b. $R(x) = -50x^2 + 15{,}000x$

D) a. $N(x) = 50x + 15{,}000$
b. $R(x) = 50x^2 + 15{,}000x$

5) The annual yield per apple tree is fairly constant at 300 pounds per tree when the number of trees per acre is 40 or fewer. For each additional tree over 40, the annual yield per tree for all trees on the acre decreases by 5 pounds due to overcrowding.
a. Express the yield per tree, Y, in pounds, as a function of the number of apple trees per acre, x.
b. Express the total yield for an acre, T, in pounds, as a function of the number of apple trees per acre, x.

A) a. $Y(x) = 5x + 500$
b. $T(x) = 5x^2 + 500x$

B) a. $Y(x) = 5x + 100$
b. $T(x) = 5x^2 + 100x$

C) a. $Y(x) = -5x + 100$
b. $T(x) = -5x^2 + 100x$

D) a. $Y(x) = -5x + 500$
b. $T(x) = -5x^2 + 500x$

6) A car rental agency charges $150 per week plus $0.20 per mile to rent a car. How many miles were driven during the week if the weekly cost to rent the car was $238?

A) 98 mi B) 440 mi C) 430 mi D) 88 mi

7) According to a recent survey, in 2000, 53% of households had one or more pets. Throughout the next decade, this decreased by approximately 2% per year. If this trend continues, in which year will 30% of households have pets?

A) 2013 B) 2011 C) 2012 D) 2010

8) A train ticket in a certain city is $2.50. People who use the train also have the option of purchasing a frequent rider pass for $15.00 each month. With the pass, each ticket costs only $1.75. Determine the number of times in a month the train must be used so that the total monthly cost without the pass is the same as the total monthly cost with the pass.

A) 20 times B) 22 times C) 21 times D) 19 times

9) A discount warehouse offers two types of annual memberships. Plan A has an annual membership fee of $200 and the member pays 70% of the manufacturer's recommended list price. Plan B has an annual membership fee of $90 and the member pays 90% of the manufacturer's recommended list price. How many dollars of merchandise would a member have to purchase in a year to pay the same amount under both plans?

A) $550.00 B) $110.00 C) $1100.00 D) $55.00

2 Construct Functions from Formulas

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

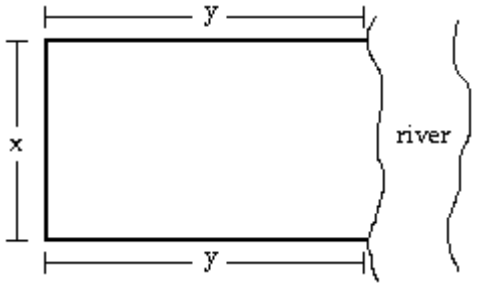
1) An open box is made from a square piece of sheet metal 23 inches on a side by cutting identical squares from the corners and turning up the sides. Express the volume of the box, V, as a function of the length of the side of the square cut from each corner, x.

A) $V(x) = x(23 - 2x)^2$ B) $V(x) = x(23 - 2x)$ C) $V(x) = 529x$ D) $V(x) = (23 - 2x)^2$

2) A kennel owner has 1400 feet of fencing to enclose a rectangular dog exercise pen. Express the area of the exercise pen, A, as a function of one of its dimensions, x.

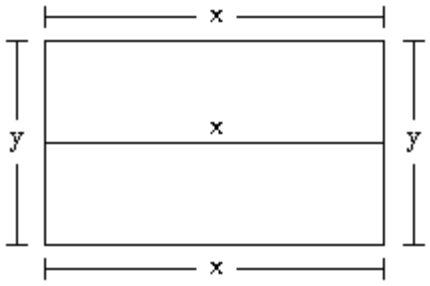
A) $A(x) = (700 - x)^2$ B) $A(x) = x(1400 - x)$ C) $A(x) = x(700 - x)$ D) $A(x) = x(x - 700)$

3) A rancher has 1400 feet of fencing to enclose a rectangular pig pen. However, one side of the pen lies along a river and requires no fencing. Express the area of the pen, A, as a function of x.



A) $A(x) = x(700 - x)$ B) $A(x) = x(\frac{1400 - x}{2})$ C) $A(x) = x(1400 - x)$ D) $A(x) = x(\frac{700 - x}{2})$

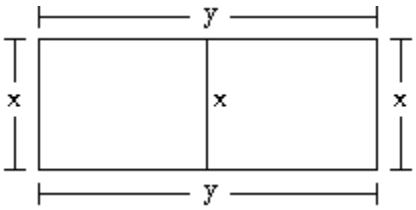
4) Two apartment tenants have a total of 1800 feet of fencing to enclose a rectangular garden and subdivide into two smaller gardens, one for each of them, by placing the fencing parallel to one of the sides. Express the area of the entire garden, A, as a function of x.



A) $A(x) = x(\frac{900 - 3x}{2})$ B) $A(x) = x(\frac{1800 - 3x}{2})$

C) $A(x) = x(900 - 3x)$ D) $A(x) = x(\frac{1800 - 2x}{3})$

5) The area of a rectangular garden is 361 square feet. The garden is to be enclosed by a stone wall costing $30 per linear foot. The interior wall is to be constructed with brick costing $13 per linear foot. Express the cost C, to enclose the garden and add the interior wall as a function of x.



A) $C(x) = 13x + 30(2x + \frac{361}{x})$

B) $C(x) = 13x + 30(2x + \frac{722}{x})$

C) $C(x) = 13x + 30(x + \frac{361}{x})$

D) $C(x) = 30x + 13(2x + \frac{722}{x})$

6) A person invested $17,000, part of the money, x, was placed in a stock that paid 9% annual interest. The rest of the money suffered a 6% loss. Express the total annual income from both investments, I, as a function of x.

A) $I(x) = -0.09x + 0.06(17{,}000 - x)$

B) $I(x) = 0.06x - 0.09(17{,}000 - x)$

C) $I(x) = 0.09x - 0.06(17{,}000 - x)$

D) $I(x) = 0.09x + 0.06(17{,}000 - x)$

7) Let P(x, y) be a point on the graph of $y = x^2 - 6$. Express the distance, d, from P to the origin as a function of the point's x-coordinate.

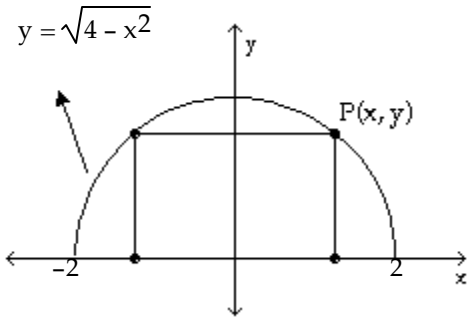
A) $d(x) = \sqrt{x^4 - 12x^2 + 36}$

B) $d(x) = \sqrt{x^4 - 11x^2 + 36}$

C) $d(x) = \sqrt{2x^2 - 6}$

D) $d(x) = \sqrt{x^2 + x - 6}$

8) The figure shows a rectangle with two vertices on a semicircle of radius 2 and two vertices on the x-axis. Let P(x, y) be the vertex that lies in the first quadrant. Express the perimeter of the rectangle, P, as a function of x.



A) $P(x) = 2x + \sqrt{4 - x^2}$

B) $P(x) = 2x\sqrt{4 - x^2}$

C) $P(x) = 4x + 2\sqrt{4 - x^2}$

D) $P(x) = 2x + 2\sqrt{4 - x^2}$

Ch. 1 Functions and Graphs
Answer Key

1.1 Graphs and Graphing Utilities

1 Plot Points in the Rectangular Coordinate System

1) A
2) A
3) D
4) C
5) B
6) A
7) A
8) D

2 Graph Equations in the Rectangular Coordinate System

1) D
2) A
3) A
4) D
5) B
6) A
7) D
8) A
9) D
10) D
11) A

3 Interpret Information About a Graphing Utility's Viewing Rectangle or Table

1) C
2) C
3) A
4) B
5) D
6) B
7) D
8) D

4 Use a Graph to Determine Intercepts

1) B
2) D
3) C
4) D
5) B
6) D
7) B

5 Interpret Information Given by Graphs

1) D
2) C
3) A
4) D
5) A
6) D
7) A
8) C
9) A

1.2 Basics of Functions and Their Graphs

1 Find the Domain and Range of a Relation

1) D
2) A
3) D
4) A
5) D
6) C
7) B

2 Determine Whether a Relation is a Function

1) B
2) B
3) A
4) A
5) B
6) B
7) A
8) A
9) B
10) B

3 Determine Whether an Equation Represents a Function

1) A
2) A
3) A
4) B
5) B
6) B
7) B
8) A
9) A
10) A
11) A
12) A
13) A

4 Evaluate a Function

1) B
2) C
3) D
4) B
5) A
6) B
7) C
8) D
9) C
10) A

5 Graph Functions by Plotting Points

1) D
2) B
3) C
4) B
5) D
6) C
7) C
8) A

6 Use the Vertical Line Test to Identify Functions

1) B
2) B
3) A
4) B
5) A
6) A
7) A
8) B
9) B
10) A
11) A
12) A
13) B

7 Obtain Information About a Function from Its Graph

1) C
2) D
3) C
4) D
5) A
6) A
7) D
8) B
9) C

8 Identify the Domain and Range of a Function from Its Graph

1) B
2) B
3) D
4) C
5) C

9 Identify Intercepts from a Function's Graph.

1) D
2) A
3) C
4) C
5) D
6) B

1.3 More on Functions and Their Graphs

1 Find and Simplify a Function's Difference Quotient

1) B
2) D
3) A
4) D
5) C

2 Understand and Use Piecewise Functions

1) C
2) B
3) D
4) B
5) B
6) C
7) B
8) D

3 Identify Intervals on Which a Function Increases, Decreases, or is Constant

1) D
2) B
3) C
4) A
5) A
6) A
7) D
8) B
9) D
10) D

4 Use Graphs to Locate Relative Maxima or Minima

1) C
2) C
3) D
4) C

5 Identify Even or Odd Functions and Recognize Their Symmetries

1) A
2) B
3) B
4) C
5) C
6) B
7) A
8) B

6 Graph Step Functions

1) C
2) C
3) C
4) D
5) C
6) D
7) A
8) B
9) D
10) B

1.4 Linear Functions and Slope

1 Calculate a Line's Slope

1) D
2) C
3) C
4) A
5) B
6) A
7) B
8) B

2 Write the Point–Slope Form of the Equation of a Line

1) D
2) B
3) D
4) C
5) C
6) C

3 Write and Graph the Slope–Intercept Form of the Equation of a Line

1) B
2) D
3) A
4) C
5) D
6) D
7) D
8) D
9) D
10) B
11) A

4 Graph Horizontal or Vertical Lines

1) A
2) C
3) C
4) A
5) D
6) B
7) D

5 Recognize and Use the General Form of a Line's Equation

1) D
2) D
3) D
4) D
5) D
6) D
7) D
8) B
9) D
10) A

6 Use Intercepts to Graph the General Form of a Line's Equation

1) C
2) D
3) D
4) C
5) D

7 Model Data with Linear Functions and Make Predictions

1) B
2) B
3) A
4) B
5) C
6) C
7) C
8) D
9) C
10) B

1.5 More on Slope

1 Find Slopes and Equations of Parallel and Perpendicular Lines

1) B
2) B
3) A
4) C

5) A
6) D
7) D
8) B
9) C
10) D

2 Interpret Slope as Rate of Change

1) B
2) A

3 Find a Function's Average Rate of Change

1) D
2) C
3) D
4) C
5) B
6) C

1.6 Transformations of Functions

1 Recognize Graphs of Common Functions

1) D
2) C
3) D
4) C
5) D
6) C

2 Use Vertical Shifts to Graph Functions

1) B
2) C
3) C
4) A
5) A
6) A

3 Use Horizontal Shifts to Graph Functions

1) C
2) A
3) B
4) C
5) C
6) D

4 Use Reflections to Graph Functions

1) C
2) A
3) D
4) C
5) A
6) D

5 Use Vertical Stretching and Shrinking to Graph Functions

1) D
2) C
3) D
4) C
5) B
6) C

6 Use Horizontal Stretching and Shrinking to Graph Functions

1) B

2) D
3) C
4) A
5) A

7 Graph Functions Involving a Sequence of Transformations

1) D
2) A
3) D
4) A
5) D
6) C
7) B
8) D
9) A
10) A
11) D
12) A
13) A

1.7 Combinations of Functions; Composite Functions

1 Find the Domain of a Function

1) B
2) D
3) B
4) D
5) A
6) A
7) A
8) B
9) A
10) B
11) B

2 Combine Functions Using the Algebra of Functions, Specifying Domains

1) C
2) C
3) B
4) C
5) B
6) C
7) B
8) A
9) C
10) C
11) A
12) A
13) B
14) A
15) B
16) A
17) D

3 Form Composite Functions

1) C
2) B
3) B
4) D

5) B
6) C
7) D

4 Determine Domains for Composite Functions

1) D
2) D
3) D
4) C
5) A
6) D

5 Write Functions as Compositions

1) B
2) B
3) B
4) B
5) D
6) D

1.8 Inverse Functions

1 Verify Inverse Functions

1) C
2) C
3) D
4) D
5) B

2 Find the Inverse of a Function

1) A
2) A
3) C
4) D
5) B
6) D

3 Use the Horizontal Line Test to Determine if a Function has an Inverse Function

1) A
2) A
3) B
4) A
5) A
6) B
7) A
8) B

4 Use the Graph of a One–to–One Function to Graph Its Inverse Function

1) B
2) A
3) A
4) B
5) C
6) A

5 Find the Inverse of a Function and Graph Both Functions on the Same Axes

1) C
2) B
3) B
4) A
5) C
6) C

7) B

1.9 Distance and Midpoint Formulas; Circles

1 Find the Distance Between Two Points

1) A
2) B
3) B
4) A
5) B
6) C
7) B
8) A

2 Find the Midpoint of a Line Segment

1) C
2) A
3) C
4) B

3 Write the Standard Form of a Circle's Equation

1) B
2) B
3) D
4) A
5) B
6) C
7) B

4 Give the Center and Radius of a Circle Whose Equation is in Standard Form

1) C
2) A
3) A

5 Convert the General Form of a Circle's Equation to Standard Form

1) A
2) B
3) D
4) D
5) C
6) B
7) B

1.10 Modeling with Functions

1 Construct Functions from Verbal Descriptions

1) D
2) D
3) C
4) C
5) D
6) B
7) B
8) A
9) A

2 Construct Functions from Formulas

1) A
2) C
3) B
4) B
5) B
6) C

7) B
8) C