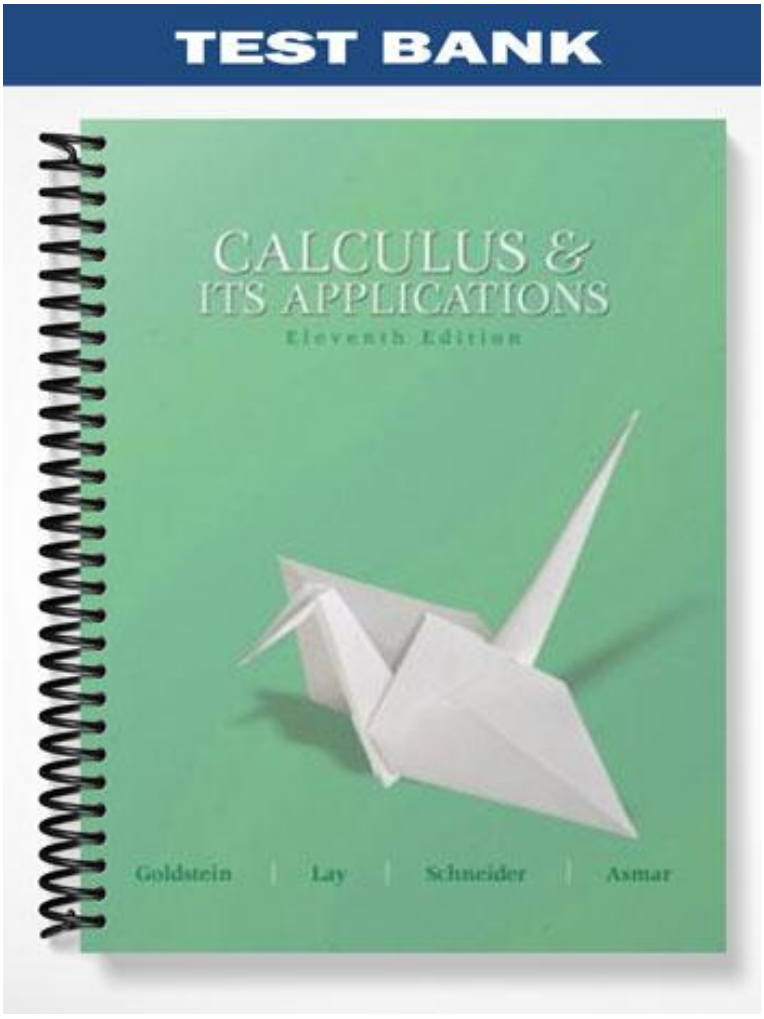
TEST BANK


CALCULUS &
ITS APPLICATIONS
Eleventh Edition
Goldstein | Lay | Schneider | Asmar

Exam

Name_____

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

1) Find the slope of the line with equation $3y + 2 = 5x - 2y$? 1) _____

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

2) Find the equation of the following line: 2) _____
Parallel to $y = -4x + 4$; (2, −5) on line.

A) $y = -\frac{1}{4}x - \frac{3}{4}$ B) $y = -4x + 3$ C) $y = -4x - 3$ D) $y = 4x - 3$

3) Find the equation of the following line: 3) _____
Perpendicular to $y = \frac{1}{5}x + 4$; (5, 5) on line.

A) $y = -5x - 30$ B) $y = -5x + 30$ C) $y = -\frac{1}{5}x - 6$ D) $y = 5x - 30$

4) Find the equation of the following line: 4) _____
Parallel to $y = -\frac{1}{7}x + 4$; (2, 4) on line.

A) $y = \frac{1}{7}x - \frac{30}{7}$ B) $y = -7x - 30$ C) $y = -\frac{1}{7}x - \frac{30}{7}$ D) $y = -\frac{1}{7}x + \frac{30}{7}$

5) Find the equation of the following line: 5) _____
Parallel to $3x + y - 4 = 0$; (2, 2) on line.

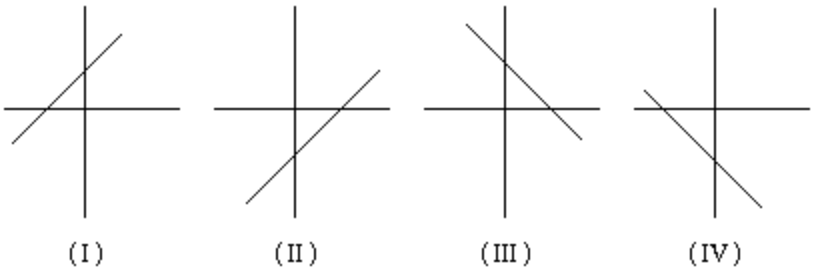
A) $y = -3x + 8$ B) $y = 3x - 8$ C) $y = -\frac{1}{3}x - \frac{8}{3}$ D) $y = -3x - 8$

6) Find the equation of the following line: 6) _____
Perpendicular to $-9x + y - 9 = 0$; (2, 5) on line.

A) $y = \frac{1}{9}x - \frac{47}{9}$ B) $y = -9x - 47$ C) $y = -\frac{1}{9}x + \frac{47}{9}$ D) $y = -\frac{1}{9}x - \frac{47}{9}$

7) Each of the lines (I), (II), (III), and (IV) in the figure below is the graph of one of the equations (i), (ii), (iii), and (iv). Match each equation with its graph. 7) _____

(i) $x + y = 3$ (ii) $x - y = 3$ (iii) $x + y = -3$ (iv) $x - y = -3$



A) (i) (III)
(ii) (II)
(iii) (IV)
(iv) (I)

B) (i) (IV)
(ii) (III)
(iii) (II)
(iv) (I)

C) (i) (II)
(ii) (III)
(iii) (I)
(iv) (IV)

D) (i) (I)
(ii) (II)
(iii) (III)
(iv) (IV)

8) Which of the following pairs of points lie on the line $x + 3y = 12$? 8) _____

A) (12, 0) and (0, 4)

B) (–12, 0) and (0, 4)

C) (0, 12) and (2, 6)

D) (1, 3) and (0, 2)

9) Consider 2 lines each having slope $\frac{4}{3}$, one passing through the point (–1, 2) 9) _____

and the other through (3, 5). Which of the following is/are true?

(I) They are parallel.
(II) They are the same line.
(III) They cross the x–axis at the same point.
(IV) They intersect at the point (0, 3).

A) (I)

B) (III)

C) (IV)

D) (II)

E) none of the above

10) Which of the following is/are true of the lines $2x - 5y = -15$ and $5x + 2y = 6$? 10) _____

(I) They are parallel.
(II) They are perpendicular.
(III) They cross the x–axis at the same point.
(IV) They cross the y–axis at the same point.

A) (II) and (III)

B) (II) and (IV)

C) (II)

D) (I)

E) none of the above

11) The average value of a certain type of automobile was $14,940 in 1991 and depreciated to $6300 in 1995. Let y be the average value of the automobile in the year x, where x = 0 represents 1991. Write a linear equation in slope–intercept form that models the value of the automobile, y, x years after 1991. 11) _____

A) y = –2160x – 2340 B) y = –2160x + 6300

C) y = –2160x + 14,940 D) $y = -\frac{1}{2160}x - 6300$

12) If (x,y) is a point on the parabola $y = 3x^2$, then the tangent line to $y = 3x^2$ passing through (x,y) has slope 6x. Find the equation of the line tangent to $y = 3x^2$ through the point (–2, 12). 12) _____

A) y = –2x + 12 B) y = 6x + 12 C) y = 12x + 6 D) y = –12x – 12

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

13) Find the slope of the line with the equation $y = 4 - 5x$. 13) _____
Enter just an integer.

14) Find the slope of the line with the equation $2x + 4y = 5$. 14) _____
Enter just a fraction of form $\frac{a}{b}$ in lowest terms.

15) Find the slope of the line with equation $2x + 4 = 2(2y + 3)$. 15) _____
Enter just a fraction of form $\frac{a}{b}$ in lowest terms.

16) Find the equation of the following line: 16) _____
Slope is 3; y–intercept is 5.
Enter your answer in slope–intercept form.

17) Find the equation of the following line: 17) _____
(2, 3) and (4, 6) on line.
Enter your answer in slope–intercept form.
Include both the slope and the intercept in your equation.

18) Find the equation of the following line: 18) _____
$\left(\frac{1}{2}, 1\right)$ and (2, 0) on line.
Enter your answer in point–slope form using $\left(\frac{1}{2}, 1\right)$.

19) Find the equation of the following line: 19) _____
Parallel to $5x - 3y = 7$; (–1, 3) on line.
Enter your answer in point–slope form with any fractions in the form of $\frac{a}{b}$ in lowest terms.

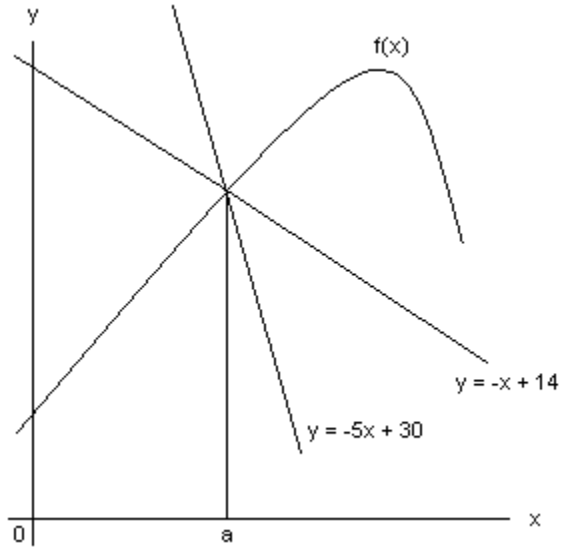
20) Find the equation of the following line: 20) _____
Perpendicular to $5x = 7 - 8y$; y–intercept is –2.
Enter your answer in slope–intercept form
with any fractions in the form $\frac{a}{b}$ in lowest terms.

21) Find the equation of the following line: 21) _____
Perpendicular to $3y - \frac{5}{2}x = 1$; y–intercept is $\frac{1}{3}$.
Enter your answer in slope–intercept form.

22) Find the equation of the following line: 22) _____
Slope is $-\frac{5}{7}$; $\left(-\frac{1}{2}, 1\right)$ on line.
Enter your answer in point–slope form.

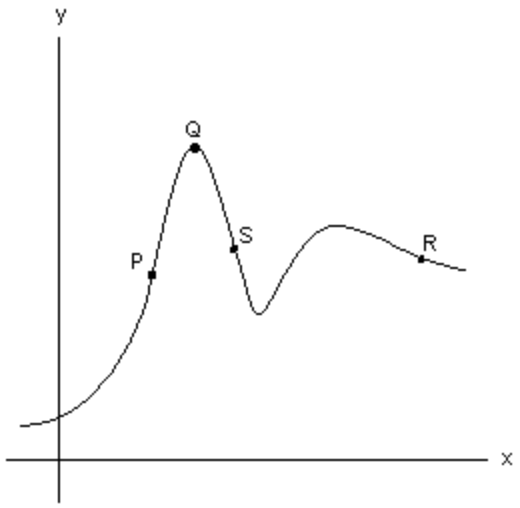
23) Find the equation of the following line: 23) _____
$\left(\frac{3}{2}, -4\right)$ and $\left(\frac{-3}{2}, -4\right)$ on the line (in the xy –plane).
Enter your equation in the simplest possible form.

24) Two lines intersect the graph of a function y = f(x) as shown. Find a and f(a). 24) _____
Enter your answer exactly in the form: a, b
where b is f(x), and a, b are integers.



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

Referring to the graph below, assign one of the following descriptors to the point: large positive slope, small positive slope, zero slope, small negative slope, large negative slope.



25) P 25) _____

A) large negative slope B) small positive slope

C) large positive slope D) small negative slope

26) Q 26) _____

A) large negative slope B) small positive slope

C) small negative slope D) zero slope

27) S 27) _____

A) zero slope B) large negative slope

C) large positive slope D) small negative slope

28) R 28) _____

A) zero slope B) small positive slope

C) large negative slope D) small negative slope

29) Which of the following lines is/are parallel to the tangent line of the graph of $y = -x^3$ at the point where $x = 1$ and the slope of the tangent line is $-3x^2$. 29) _____

(I) $y = -3x + 1$
(II) $y = 3x + 1$
(III) $y = -3x - 4$
(IV) $y = 3x + 1$

A) (I) and (III)

B) (III) and (IV)

C) (II) and (III)

D) (I) and (II)

E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

30) Find the slope of the tangent line to the graph of $y = x^2$ at the point (.9, .81) and write the equation of the tangent line. 30) _____
Enter your answer exactly as just the equation in standard point–slope form.

31) Find the slope of the tangent line to the graph of $y = x^2$ at the point $(\frac{7}{6}, \frac{49}{36})$ and write the equation of the tangent line. Enter your answer exactly as just the equation in standard point–slope form. Use all fractions of form $\frac{a}{b}$ in lowest terms. 31) _____

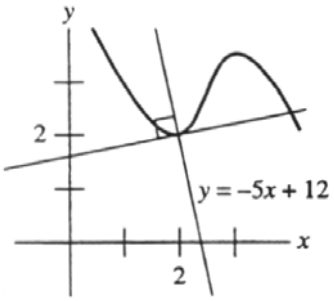
32) What is the equation of the tangent line to the graph of $y = x^2$ at the point where $x = \frac{1}{3}$? 32) _____

Enter your answer in standard point–slope form.

33) Find all points on the graph of $y = x^3$ where the curve has slope 12. 33) _____
The slope of the tangent line to the graph is $3x^2$.
Enter your answer exactly in the form: (a,b), (c,d)
where $a > c$

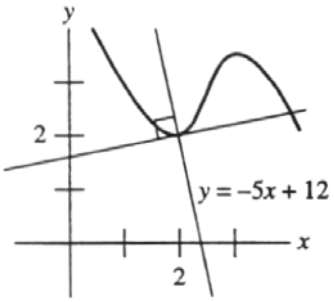
34) Find all points at which the tangent line to the graph of $y = x^3$ is parallel to the line $y = 27x + 5$. Enter your answer in the form: (a, b), (c, d) 34) _____
where $a > c$

35) Consider the curve $f(x)$ in the accompanying sketch. 35) _____



Find $f(2)$. Enter your answer as just an integer.

36) Consider the curve $f(x)$ in the accompanying sketch. 36) _____



Find the slope of the tangent line at the point where $x = 2$.
Enter your answer as just a fraction or an integer.

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

37) Find the derivative of $f(x) = x^{5/2}$. 37) _____

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

38) Find the derivative of $f(x) = \frac{1}{\sqrt[3]{x}}$. 38) _____

A) $\frac{-1}{3x^{4/3}}$ B) $\frac{2}{3}x^{-4/3}$

C) $\frac{5}{3x^2}$ D) none of the above

39) Find the derivative of f(x) = 7x – 19 at x = 2. 39) _____

A) 34 B) 7 C) 9 D) 14

40) Find the derivative of $f(x) = 2\sqrt{x}$ at x = 4. 40) _____

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

41) Find the slope of the curve $y = x^6$ at $x = -3$. 41) _____

A) slope = 1458 B) slope = –4374 C) slope = –1458 D) slope = 4374

42) Which of the following is the equation of the line tangent to the curve $y = \sqrt{x}$ at $x = 9$? 42) _____

(I) $y = -x - \frac{1}{6}$ (II) $y = \frac{1}{2}x + 3$

(III) $y = \frac{1}{6}x + \frac{3}{2}$ (IV) $y = \frac{1}{2}x^{-1/2} - \frac{1}{6}$

A) (I)

B) (IV)

C) (II)

D) (III)

E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

43) Find the derivative of $f(x) = \frac{5}{x^2}$. Enter your answer exactly in the form: ax^b 43) _____

Where a, b are integers. Do not use parentheses.

44) Find the derivative of $f(x) = 4x^{5/4}$. Enter your answer in the form: ax^b 44) _____
Where a, b are either fractions in lowest terms or integers. No parentheses.

45) Find the derivative of $f(x) = \frac{1}{x^2}$. 45) _____

Enter your answer exactly in the form: ax^b

46) Find the derivative of $f(x) = \frac{1}{\sqrt{x}}$. 46) _____

Enter your answer exactly in the form: ax^b
No parentheses.

47) Find the derivative of $f(x) = x^{6/5}$. 47) _____
Enter your answer in the form: ax^b

where a, b are either fractions of the form $\frac{c}{d}$ or integers. No parentheses.

48) Find the derivative of $f(x) = x^{4/5}$ at x = 32. Enter just a reduced fraction or an integer. 48) _____

49) If $g(x) = 2x^2 - x + 3$, compute $g(1)$ and $g'(1)$. 49) _____
Enter your exactly in the form: $g(1) = a$, $g'(1) = b$ where a, b are integers.

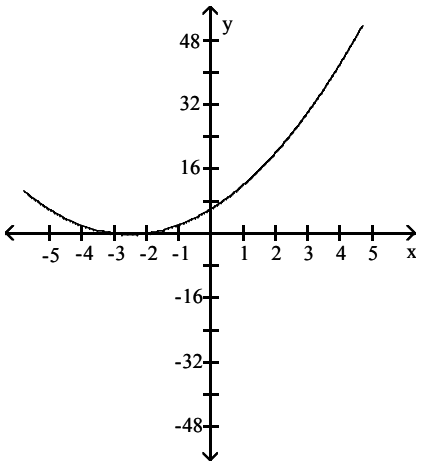
50) Find the slope of the tangent line to the curve $y = \sqrt[3]{x^2}$ at the point (8, 4), and write the equation of this line. Enter your answer as just the equation of the line in standard point–slope form using only fractions of form $\frac{a}{b}$ in lowest terms or integers. 50) _____

51) Determine: $\frac{dy}{dx}$ if $y = 4 - 6x$. Enter your answer as just an integer. 51) _____

52) Determine: $\frac{dy}{dx}$ if $y = \frac{x - 2}{5}$. Enter your answer as just an integer or a reduced fraction . 52) _____

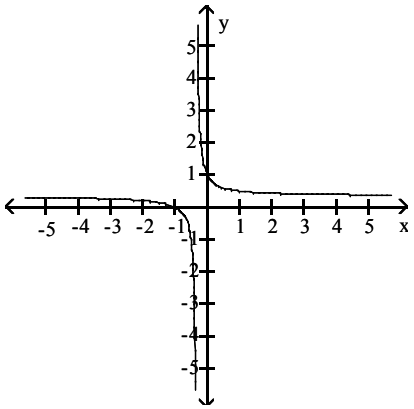
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

53) For the following function $g(x)$, determine whether or not $\lim_{x \to 2} g(x)$ exists. If so, give the limit. 53) _____



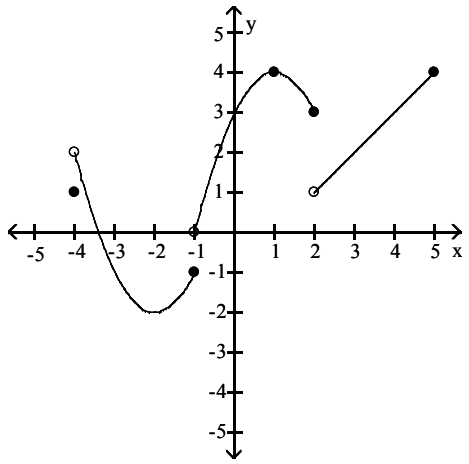
A) 20 B) 2 C) 0 D) does not exist

54) For the following function $f(x)$, determine whether or not $\lim_{x \to 0} f(x)$ exists. If so, give the limit. 54) _____



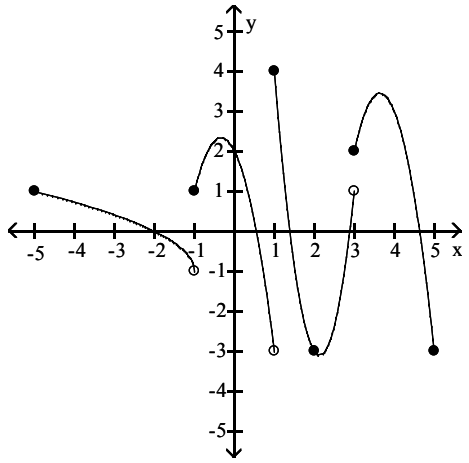
A) 1 B) $\frac{1}{3}$ C) 0 D) does not exist

55) For the following function $g(x)$, determine whether or not $\lim_{x \to 2} g(x)$ exists. If so, give the limit. 55) _____



A) 3 B) 1 C) 0 D) does not exist

56) For the following function $g(x)$, determine whether or not $\lim_{x \to -1} g(x)$ exists. If so, give the limit. 56) _____



A) 1 B) –1 C) 0 D) does not exist

57) Determine whether or not the following limit exists. If, so compute the limit. 57) _____

$$\lim_{x \to -1} \frac{x^2 - 1}{x + 1}$$

A) does not exist

B) –2

C) 0

D) 1

E) none of the above

58) Determine whether or not the following limit exists. If, so compute the limit. 58) _____

$$\lim_{x \to 3} \frac{\sqrt{x} - 4}{x^3 + 27}$$

A) $\sqrt{3} - 4$

B) 0

C) does not exist

D) $\frac{\sqrt{3} - 4}{54}$

E) none of the above

59) If $f(t) = \frac{1}{x^{2/3}}$, then $\lim_{h \to 0} \frac{f(-8 + h) - f(-8)}{h}$ equals 59) _____

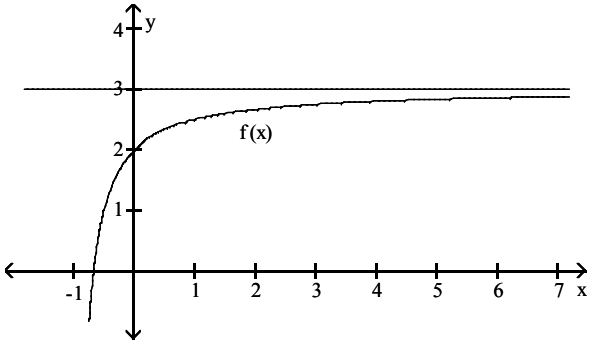
A) $f'(8)$ B) $\frac{1}{48}$

C) $f'(0)$ D) none of the above

60) Compute the limit: $\lim_{x \to \infty} \frac{2x^2 + 1}{x^2 + 1}$. 60) _____

A) 1 B) 2 C) ∞ D) 0

Using the graph below, find the given limit.



61) $\lim_{x \to \infty} (2f(x) - 1)$ 61) _____

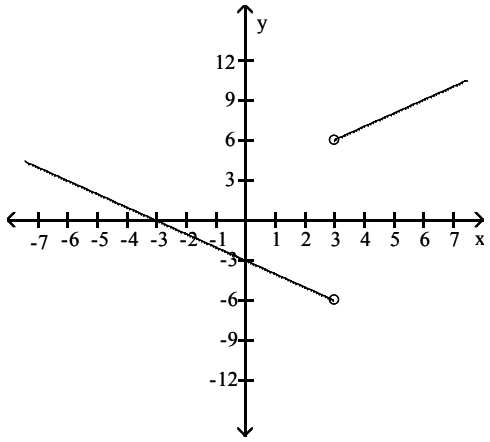
A) 6 B) 0 C) 5 D) 2

62) $\lim_{x \to 0} [f(x)]^2$ 62) _____

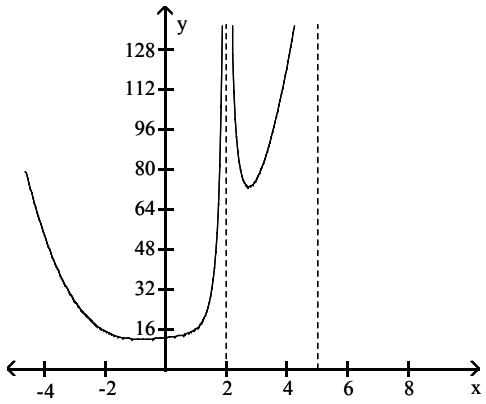
A) 6 B) 0 C) 4 D) 9

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

63) For the following function $f(x)$, determine whether or not $\lim_{x \to 3} f(x)$ exists. If so, give the limit. Enter either a real number or enter the words "does not exist". 63) _____



64) For the following function $f(x)$, determine whether or not $\lim_{x \to 2} f(x)$ exists. If so, give the limit. Enter either a real number or the words "does not exist". 64) _____



Calculate the following limit(s) if they exist.

65) $\lim_{x \to -1} (x^3 - 2x + 5)$. Enter just an integer or "does not exist". 65) _____

66) $\lim_{x \to 0} \dfrac{(x+1)^{1/2} - 1}{x}$ Enter your answer as just a fraction or an integer, or the words "does not exist". 66) _____

67) $\lim_{x \to 1} \dfrac{x^6 - 1}{x^3 - 1}$ Enter your answer as just an integer or a fraction in lowest terms, or the words "does not exist". 67) _____

68) $\lim_{x\to 5} \frac{x^2 - 8x + 15}{x^2 - 7x + 10}$ Enter your answer as just a fraction in lowest terms or an integer, or the words "does not exist". 68) _____

69) $\lim_{x\to 3} 4x^3$ Enter your answer as an integer. 69) _____

70) $\lim_{x\to 2} (2x + 2)^2$ Enter your answer as an integer, or "does not exist". 70) _____

71) $\lim_{x\to -1} \left[(x + 1)^3 (x^2 + 1)\sqrt{2x + 1}\right]$ Enter your answer as an integer, or "does not exist". 71) _____

72) $\lim_{x\to -1} \frac{x^2 - 4x - 5}{x + 1}$ Enter your answer as a fraction, integer, or "does not exist". 72) _____

73) $\lim_{x\to -1} \frac{x^2 + x - 2}{x^3 + 1}$ Enter either a fraction, integer, or "does not exist". 73) _____

74) $\lim_{x\to 0} \frac{1}{x^3 - 1} + 1$ Enter either a fraction in lowest terms, an integer, or "does not exist". 74) _____

75) $\lim_{x\to 1} \frac{1}{x^3 - 1} + 1$ Enter either a fraction, integer, or the words "does not exist" 75) _____

76) $\lim_{x\to -2} \frac{x}{(x^3 + 8)^{-1}}$. Enter either a fraction, integer, or the words "does not exist". 76) _____

77) Compute the following limit $\lim_{x\to 0} \frac{g(x)}{f(x)}$ where $\lim_{x\to 0} f(x) = -\frac{1}{3}$ and $\lim_{x\to 0} g(x) = \frac{2}{3}$. 77) _____

Enter your answer as an integer, fraction in lowest terms, or the words "does not exist".

78) Compute the limit $\lim_{x\to 0} \frac{7}{2f(x) + g(x)}$ where $\lim_{x\to 0} f(x) = -\frac{1}{3}$ and $\lim_{x\to 0} g(x) = \frac{2}{3}$. 78) _____

Enter your answer as a fraction, integer, or the words "does not exist".

79) Use limits to compute f'(5) where $f(x) = \sqrt{3x + 1}$. 79) _____
Enter just an integer or a fraction in lowest terms.

80) Use limits to compute f'(1) where $f(x) = \frac{1}{2 - 5x}$. 80) _____

Enter just a fraction in lowest terms or an integer.

81) Let $f(x) = \frac{1}{2x}$. Compute $f'(3)$ using limits. Enter a reduced fraction or an integer. 81) _____

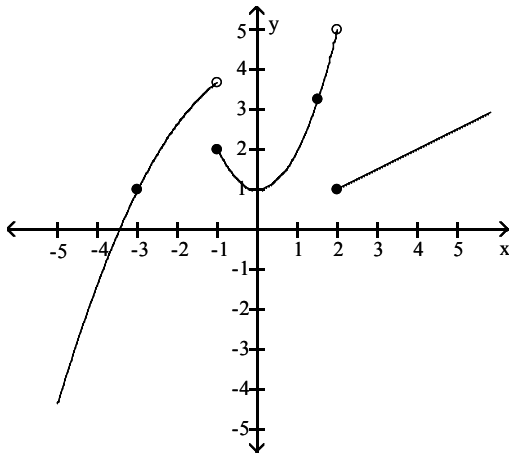
82) Let $f(x) = (2x + 1)^2$. Compute $f'(0)$ using limits. Enter a reduced fraction or an integer. 82) _____

83) Compute $\lim_{x \to \infty} \frac{3}{x^2 + 1}$. Enter just an integer or a fraction. 83) _____

84) Compute $\lim_{x \to \infty} \frac{x^3}{x^3 - 1}$. Enter just an integer or a fraction. 84) _____

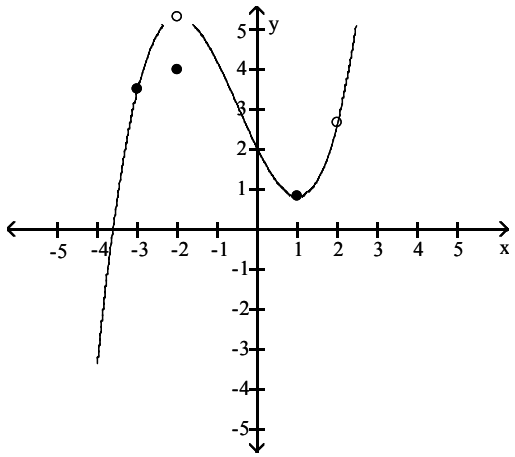
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

85) Use the graph of f to determine if f is continuous at $x = \frac{3}{2}$. 85) _____



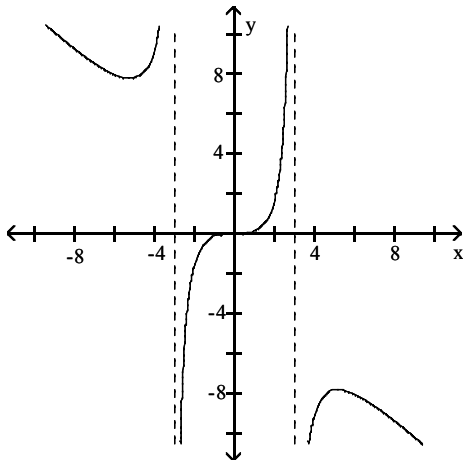
A) yes B) no

86) Use the graph of f to determine if f is continuous at $x = 2$. 86) _____



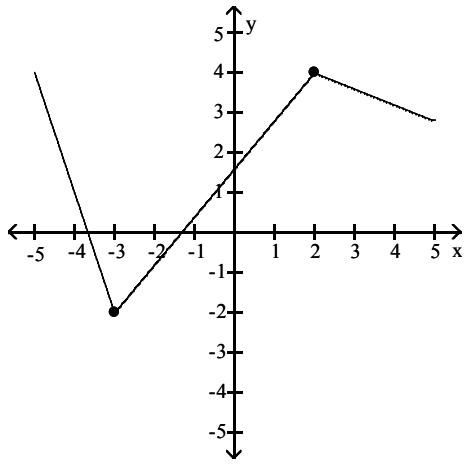
A) no B) yes

87) For the graphed function below, state the x–values for which the derivative does not exist. 87) _____



A) $x = 0, 9, -9$ B) $x = 0, 3, -3$ C) $x = 3, -3$ D) $x = 9, -9$

88) For the graphed function below, state the x–values for which the derivative does not exist. 88) _____



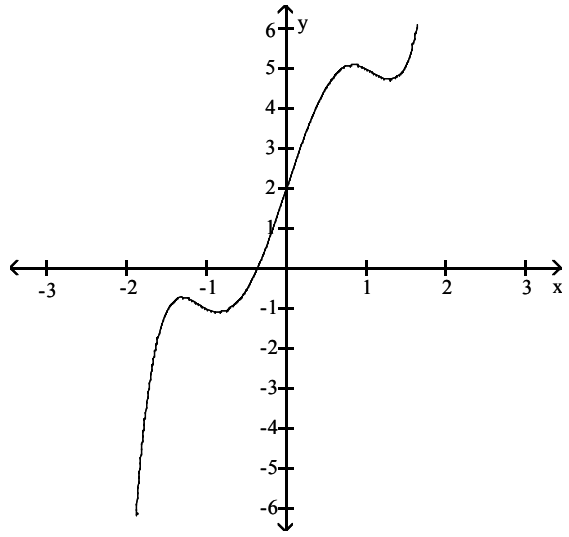
A) $x = 2, 4, -3, -2$

B) $x = -3, -2$

C) $x = 2, -3$

D) f is differentiable for all values of x

89) For the graphed function below, state the x–values for which the derivative does not exist. 89) _____



A) $x = 0, 1, -1$

B) $x = 0$

C) $x = 1, -1$

D) f is differentiable for all values of x

90) Which of the following properties are satisfied by the following function: 90) _____

$$f(x) = \begin{cases} x^2 + 1 & \text{for } x < 0 \\ 1 & \text{for } x = 0 \\ 5x + 1 & \text{for } x > 0 \end{cases}$$

(I) f(x) is continuous
(II) f(x) is differentiable for all x
(III) f(x) is differentiable at x = –2

A) III only

B) I, II, and III

C) I only

D) I and II only

E) I and III only

91) A company is planning to manufacture a new blender. After conducting extensive market surveys, the research department estimates a weekly demand of 600 blenders at a price of $50 per blender and a weekly demand of 800 blenders at a price of $40 per blender. Assuming the demand equation is linear, use the research department's estimates to find the revenue equation in terms of the demand x. 91) _____

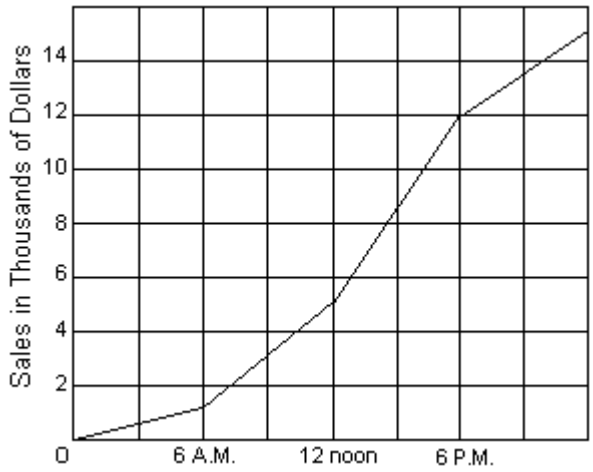
A) $R(x) = 80x - \frac{x^2}{20}$

B) $R(x) = 80x - 20x^2$

C) $R(x) = 20x + \frac{x^2}{20}$

D) $R(x) = 80x - 20$

92) The graph below shows the total sales (in thousands of dollars) in a supermarket during a typical 24–hour period. 92) _____



(i) Estimate the rate of sales during the period from 6 A.M. to 12 noon.
(ii) Which 6–hour interval sees the highest rate of sales and what is this rate?

A) (i) $167/hr
(ii) 6pm to 12 noon

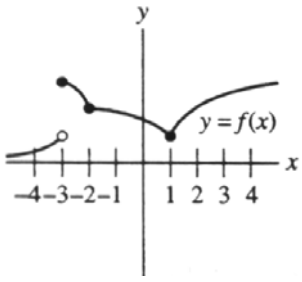
B) (i) $667/hr
(ii) 12 noon to 6 pm $1167/hr.

C) (i) $1167/hr
(ii) noon to 6pm

D) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

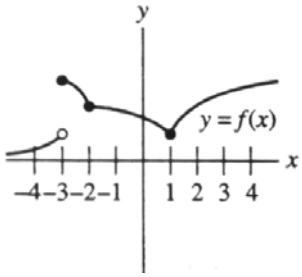
93) In the graph of $y = f(x)$, for which values of x is $f(x)$ not continuous? 93) _____
Enter your answer exactly in the form: $x = a$ where a is an integer.
(If there is more than one value of x then enter: $x = a, b, c$)



94) In the graph of $y = f(x)$, for which values of x is $f(x)$ not differentiable? 94) _____

Enter your answer exactly in the form: $x = a, b, c$ where $a < b < c$

If there are fewer or more terms, separate them with commas in increasing order.



95) Does $\lim_{x \to -a} \frac{x - a}{x^2 - a^2}$ (where $a \neq 0$) exist? 95) _____

Enter your answer as either "yes" or "no" or "does not exist".

96) Let $f(x) = \frac{x^3 - 9x}{2x + 6}$. Does $\lim_{x \to -3} f(x)$ exist? 96) _____

Enter your answer as either "yes" or "no" or "does not exist".

97) Let $f(x) = \frac{x^3 - 9x}{2x + 6}$. Is $f(x)$ continuous at $x = -3$? 97) _____

Enter your answer as either "yes" or "no" or "does not exist".

98) The function $i(x) = \frac{x^2 + 2x - 35}{x + 7}$ is continuous everywhere except at $x = -7$. 98) _____

If possible, define $f(x)$ at $x = -7$ in a way that makes $f(x)$ continuous for all x.

Enter your answer exactly as just: $f(-7) = a$ where a is an integer

or enter the words "not possible".

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

99) Differentiate: $f(x) = 4x^2 + 9x - 6$. 99) _____

A) $f'(x) = 8x + 9$ B) $f'(x) = 4x^2 + 9$ C) $f'(x) = 4x + 9$ D) $f'(x) = 8x^2 + 9$

100) Differentiate: $f(x) = 4x^4 - 6x^3 - 3$ 100) _____

A) $f'(x) = 16x^3 - 18x^2 - 7$ B) $f'(x) = 4x^3 + 3x^2$

C) $f'(x) = 4x^3 + 3x^2 - 7$ D) $f'(x) = 16x^3 - 18x^2$

101) Differentiate: $y = -\frac{2}{3x^4}$ 101) _____

A) $\frac{dy}{dx} = \frac{8}{3x^5}$ B) $\frac{dx}{dy} = \frac{24}{x^5}$ C) $\frac{dx}{dy} = -\frac{8}{3}x^5$ D) $\frac{dy}{dx} = \frac{8}{(3x)^5}$

102) Differentiate: $f(x) = \dfrac{2x - (x^2 + 1)^7}{3}$ 102) _____

A) $f'(x) = \dfrac{2-x}{3(x^2 + 1)^6}$

B) $f'(x) = \dfrac{2}{3} - \dfrac{14}{3}x(x^2 + 1)^6$

C) $f'(x) = 2 - 7(x^2 + 1)^6$

D) none of the above

103) Differentiate: $h(x) = \dfrac{5}{x^3 - 4x^2 + 2}$ 103) _____

A) $h'(x) = \dfrac{-15x^2 + 40x}{(x^3 - 4x^2 + 2)^2}$

B) $h'(x) = \dfrac{3x^2 - 8x}{(x^3 - 4x^2 + 2)^2}$

C) $h'(x) = \dfrac{5}{(3x^2 - 8x)^2}$

D) $h'(x) = \dfrac{15x^2 - 40x}{x^3 - 4x^2 + 2}$

104) Find the slope of the graph of $y = \sqrt{2x^2 + 1}$ at the point (2, 3). 104) _____

A) $\dfrac{4}{3}$

B) 12

C) $\dfrac{1}{4}$

D) $\dfrac{3}{2}$

E) none of the above

105) Find the equation of the tangent line to the graph of $y = -\dfrac{3}{5x + 2}$ at $x = 3$. 105) _____

A) $y - 3 = 15(5x - 2)^{-2}$

B) $y = \dfrac{15}{(5x - 2)^2}$

C) $y = \dfrac{15}{169}(x - 3)$

D) $y = \dfrac{15}{289}(x - 3) - \dfrac{3}{17}$

106) The tangent line to the curve $y = \dfrac{1}{6}x^3 - \dfrac{1}{4}x^2 - x + 4$ is perpendicular to the line $18x + 9y = -37$ at two points on the curve. Find the two points. 106) _____

A) $(-2, -\dfrac{1}{3}), (1, \dfrac{59}{12})$

B) $(2, \dfrac{7}{3}), (-1, \dfrac{55}{12})$

C) (2, 0), (–1, 0)

D) $(2, \dfrac{7}{3}), (1, \dfrac{55}{12})$

Find the slope

107) Find the slope of the tangent line to the curve $y = \dfrac{4}{3\left(x^3 - 2x^2 + 3x - 5\right)}$ at $\left(2, \dfrac{4}{3}\right)$ 107) _____

A) $-\dfrac{28}{3}$ B) $-\dfrac{8}{3}$ C) $\dfrac{2}{3}$ D) $\dfrac{8}{3}$ E) $\dfrac{4}{3}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

108) Differentiate: $y = x^{15/19}$ 108) _____

Enter your answer exactly in the form: ax^b
where *a, b* are either fractions or integers. No parentheses. No labels.

109) Differentiate: $y = -\frac{1}{2x^2}$ 109) _____

Enter your answer exactly in the form: ax^b where *a,b* are fractions or integers.
No parentheses. If a power or coefficient is "1" then leave it off.

110) Differentiate: $y = \frac{5}{x^3}$ Enter your answer in the form: ax^b. No parentheses. 110) _____

111) Differentiate: $f(x) = \sqrt{x}$ Enter your answer as just: ax^b. No parentheses. 111) _____

112) Differentiate: $f(x) = \frac{1}{x^2 + 5}$ Enter your answer as just: $\frac{\mathrm{P}(x)}{(\mathrm{Q}(x))^a}$ 112) _____

Where P(x) and Q(x) are polynomials in standard form.

113) Differentiate: $F(x) = \sqrt{3x + 1}$ Enter your answer as just: $a\mathrm{P}(x)^b$ 113) _____
Where P(x) is a polynomial in standard form.

114) Differentiate: $y = \frac{1}{x^2 + 1}$ Enter your answer exactly in the form: $\frac{\mathrm{P}(x)}{(\mathrm{Q}(x))^a}$ 114) _____

where P(x) and Q(x) are polynomials in standard form.

115) Differentiate: $y = \frac{3}{4x^2 + 1}$ Enter your answer exactly as just: $\frac{\mathrm{P}(x)}{\mathrm{Q}(x)^a}$ 115) _____

where P(x) and Q(x) are polynomials in standard form.

116) Differentiate: $y = \frac{4}{4x + 1}$ Enter your answer exactly as just: $\frac{\mathrm{P}(x)}{\mathrm{Q}(x)^a}$ 116) _____

where P(x) and Q(x) are polynomials in standard form.

117) Differentiate: $y = 3\sqrt{5x^2 + 2}$ Enter your answer exactly as: $\frac{dy}{dx} = \frac{\mathrm{P}(x)}{\sqrt{\mathrm{Q}(x)}}$ 117) _____

where P(x) and Q(x) are polynomials in standard form.

118) Differentiate: $y = \sqrt{x^4 + 1}$ Enter your answer exactly as: $\frac{dy}{dx} = \frac{\mathrm{P}(x)}{\sqrt{\mathrm{Q}(x)}}$ 118) _____

where P(x) and Q(x) are polynomials in standard form.

119) Differentiate: $y = \sqrt{3x^2 + 4x}$ Enter your answer exactly as: $\frac{dy}{dx} = \frac{\mathrm{P}(x)}{\sqrt{\mathrm{Q}(x)}}$ 119) _____

where $\mathrm{P}(x)$ and $\mathrm{Q}(x)$ are polynomials in standard form.

120) Differentiate: $y = \frac{2}{\sqrt{2x + 1}}$ Enter your answer exactly as: $\frac{dy}{dx} = a(\mathrm{P}(x))^b$ 120) _____

where $\mathrm{P}(x)$ is a polynomial in standard form. *a, b* reduced fractions or integers.
No parentheses on coefficients or powers.

121) Differentiate: $y = \frac{4}{3x^3 + x^2 + 4}$ Enter your answer as just: $\frac{\mathrm{P}(x)}{(\mathrm{Q}(x))^a}$ 121) _____

Where $\mathrm{P}(x)$ and $\mathrm{Q}(x)$ are polynomials in standard form.

122) Differentiate: $y = \frac{1}{\sqrt{2x + 1}}$ Enter your answer as just: $\frac{\mathrm{P}(x)}{(\mathrm{Q}(x))^a}$ 122) _____

Where $\mathrm{P}(x)$ and $\mathrm{Q}(x)$ are polynomials in standard form.

123) Find the slope of the graph of $y = (x^2 - 7)^3$ at $x = 3$. Enter just an integer. 123) _____

124) Find the slope of the graph of $f(x) = 1 + 3x - x^2$ at $x = 5$. Enter just an integer. 124) _____

125) Find the slope of the graph of $y = x^9 - 2x + \left(\sqrt{5 - x}\right)^3$ at (1, 7). Enter just an integer. 125) _____

126) Find the equation of the tangent line to the curve $y = \frac{1}{x + 2}$ at $\left(2, \frac{1}{4}\right)$. 126) _____

Enter your answer in standard slope–intercept form using reduced fractions .
No parentheses.

127) Find the slope of the tangent line to the curve $y = \frac{3}{(x + 2)^2}$ at $x = 3$. 127) _____

Enter a reduced fraction only.

128) Find the slope of the tangent line to the curve $y = 2(x^3 + 4)^2$ at $x = -1$. 128) _____
Enter just an integer.

129) Find the equation of the tangent line to the curve $y = \sqrt{x^2 + 5}$ at (2, 3) . 129) _____
Enter your answer in standard point–slope form using reduced fractions and integers.

130) Find the equation of the tangent line to the curve $y = 1 + 3x - x^2$ at $x = 5$. 130) _____
Enter your answer in standard slope–intercept form.

131) Find the slope of the tangent line to the curve $y = 3x^4 + 2x^3$ at $x = 1$. 131) _____
Enter just an integer.

132) Find the equation of the tangent line to the curve $y = x^3 + 4x^2 + 4$ at (1, 9) . 132) _____
Enter your answer in standard slope–intercept form.

133) Find the equation of the tangent line to the curve $y = x^3 + 3x - 8$ at $x = 2$. 133) _____
Enter your answer in standard point–slope form.

134) Let $g(x) = 2x^3 - 5x^2 + 1$; find $g'(3)$. Enter just an integer. 134) _____

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

135) Find the first derivative of $w(t) = 7t^2 - 19\sqrt{t} + 23$ 135) _____

A) $14t - \frac{19}{2\sqrt{t}}$ B) $\frac{7}{2}t - \frac{19}{2}\sqrt{t}$ C) $\frac{7}{2}t - \frac{19}{2\sqrt{t}}$ D) $14t - \frac{19}{2}\sqrt{t}$

136) Find the first derivative of $y = T^7 - 9T^5 + 2T^4 + 59$ 136) _____

A) $T^6 - 9T^4 + 2T^3$ B) $T^6 - 9T^4 + 2T^3 + 59$

C) $7T^6 - 45T^4 + 8T^3$ D) $7T^6 - 45T^4 + 8T^3 + 59$

137) Find $\frac{d}{du}\sqrt{u^4 - 7}$. 137) _____

A) $\frac{4u}{\sqrt{u^2 - 7}}$ B) $\frac{2u}{\sqrt{u^2 - 7}}$ C) $\frac{2u}{\sqrt{u^4 - 7}}$ D) $\frac{2u^3}{\sqrt{u^4 - 7}}$

138) Find $\frac{d}{ds}(p^2s^4 - q^4 r^3s^2)$ 138) _____

A) $8p^2s^3 - 24q^4 r^3s$ B) $8ps^3 - 24q^3r^2s$

C) $2ps^4 - 4q^3r^3s^2$ D) $4p^2s^3 - 2q^4 r^3s$

139) Find the second derivative of $y = \frac{1}{2x} + 3$. 139) _____

A) $\frac{1}{6x^4}$

B) $-\frac{1}{6x^4}$

C) $-6x^4$

D) $2x^0$

E) none of the above

140) Find the second derivative of $f(x) = 7x^2 + 5x - 3$ 140) _____

A) 7 B) $14x + 5$ C) 14 D) 0

141) Find the second derivative of $f(x) = 2x^4 - 4x^2 + 2$. 141) _____

A) $24x^2 - 8$ B) $8x^2 - 8$ C) $8x^2 - 8x$ D) $24x^2 - 8x$

142) Let $V = \frac{4}{3}\pi r^3$. Compute is $\left.\frac{dV}{dr}\right|_{r=2}$. 142) _____

A) $\frac{16\pi}{9}$

B) 16π

C) 8π

D) $\frac{32}{3}$

E) none of the above

143) Let $y = (-4 + 3\sqrt{x})^4$. Compute $\left.\frac{dy}{dx}\right|_{x=4}$. 143) _____

A) $\frac{27}{16}$

B) -6

C) 6

D) 24

E) none of the above

144) Compute $\left.\frac{d^2}{dt^2}(2\sqrt{2t})\right|_{t=4}$. 144) _____

A) $\frac{1}{16}$

B) $-\frac{1}{8}$

C) $-\frac{1}{2}$

D) $\frac{1}{8}$

E) none of the above

Compute the second derivative

145) Find the second derivative of $f(x) = \frac{1}{3}x^{3/2} - \frac{4}{3}x^{1/4} + 5x - 2$ 145) _____

A) $x^{1/2} + \frac{4}{9}x^{-7/4}$

B) $\frac{1}{2}x^{1/2} - \frac{1}{3}x^{-3/4} + 5$

C) $\frac{2}{9}x^{1/2} - \frac{16}{3}x^{-3/4} + 5$

D) $\frac{1}{4}x^{-1/2} + \frac{1}{4}x^{7/4}$

E) $\frac{1}{4}x^{-1/2} - \frac{1}{4}x^{-7/4}$

146) Find the second derivative of $f(x) = \frac{2x}{3x^2 + 4x}$ for $x \neq 0$. 146) _____

A) $2(3x + 4)^{-1}$

B) $(-2)3^{-2}$

C) $36(3x + 4)^{-3}$

D) $12(3x + 4)^{-3}$

E) $-6(3x + 4)^{-2}$

147) Find the second derivative of $f(x) = \frac{3}{2x - 4}$ for $x \neq 0$. 147) _____

A) 0

B) $24(2x - 4)^{-3}$

C) $3(2x - 4)^{-1}$

D) $-6(2x - 4)^{-2}$

E) $12(2x - 4)^{-3}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

148) Find the first derivative of $y = (x^3 + 4x)^5$ at $x = 1$. Enter just an integer. 148) _____

149) Find the first derivative of $z = 4t + (3 - \sqrt{2t + 1})^3$ at $t = \frac{3}{2}$. 149) _____

Enter just a fraction of form $\frac{a}{b}$ in lowest terms.

150) Find second derivative of $y = x^{3/2} + x^2$ at $x = 4$. 150) _____

Enter just a fraction of form $\frac{a}{b}$ in lowest terms.

151) Find the second derivative of $f(x) = 3x^4 - 4x^3 + 5x + 1$. 151) _____
Enter just a polynomial in standard form, unlabeled.

152) Find second derivative of $y = (2x - 4)^5$ at $x = -1$. Enter just an integer. 152) _____

153) Find the second derivative of $y = \pi + \sqrt{3}$. Do not label your answer. 153) _____

154) Find the second derivative of $f(s) = \frac{4}{3}\pi s^3$ at $s = \frac{1}{\pi}$. Enter just a real number. 154) _____

155) Find the second derivative of $U = (3u - 7)^4 - u^3$ at $u = \frac{5}{3}$. Enter just a real number. 155) _____

156) Let $f(t) = t^3 - \frac{9}{t}$. Compute $\left.\frac{d^2f}{dt^2}\right|_{t=3}$. Enter just a fraction $\frac{a}{b}$ in lowest terms. 156) _____

157) Let $y = \sqrt{5t^2 - 6}$. Compute $\left.\frac{dy}{dt}\right|_{t=2}$. Enter just a reduced fraction of form $\frac{a}{b}$. 157) _____

158) Compute $\left.\frac{d^2y}{dy^2}\left(\frac{9t^{2/3}}{2}\right)\right|_{t=8}$. Enter just a reduced fraction of form $\frac{a}{b}$. 158) _____

159) Compute $f''(2)$ when $f(t) = \frac{3}{(3t-1)^2}$. Enter just a reduced fraction of form $\frac{a}{b}$. 159) _____

160) Compute $\frac{d}{dt}(\frac{dv}{dt})$, where $v = -5t^3 + \frac{2}{1 - t}$ at $t = -1$. Enter just a reduced fraction of form $\frac{a}{b}$. 160) _____

161) Compute the third derivative of $f(x) = 3x^4 - 4x^3 + 5x + 1$. Enter your answer as an unlabeled polynomial in x in standard form. 161) _____

162) Compute the third derivative of the following function: $f(z) = \frac{3}{2z - 2}$ at $z = \frac{5}{2}$. 162) _____

Enter just a reduced fraction of form $\frac{a}{b}$.

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

163) Which of the following is the best description of $f'(t)$? 163) _____

A) The derivative as a function is the best approximation of the tangent to line to $f(x)$.

B) It is approximately equal to $\frac{f(t+h)-f(t)}{h}$, as t gets very small.

C) $f'(a)$ measures the rate of change of $f(t)$ per unit change in t at the point $t = a$.

D) $f'(t) = \frac{f(t)}{t}$

E) It is a function which gives the slope of the secant line through any two points.

164) During the month of February, a flu epidemic hit the University. The number of people sick at time t (measured in days) is given by the function $P(t)$. The rate at which the epidemic is spreading on February 3 is 110 people per day. How is the information best represented mathematically? 164) _____

A) $P(3) = 110$

B) $P'(3) = 110$

C) $\left.\frac{dP}{dt}\right|_{t=3} = P'(3)$

D) $\left.\frac{dP}{dt}\right|_{t=110}$

E) none of the above

165) At time $t = 0$, a seed is planted. After t weeks, the height of the plant is given by $f(t) = 0.3t^2 + 0.6t + 0.5$ inches. At what rate is the plant growing after 8 weeks? 165) _____

A) $0.6t + 0.6$ inches/week

B) 10.1 inches/week

C) 24.5 inches/week

D) 5.4 inches/week

E) none of the above

marginals

166) If the cost function for producing a product is $C(x) = x^3 - \frac{1}{2x^2} + 3x + 2$ find the answer closest to 166) _____

the marginal cost at a production level of 10 units.

A) 293 B) –697 C) 297 D) .30 E) 697

167) If the revenue function is $R(x) = x^{2/3} + 2x^{1/2} + 6x + 2$ for producing a product, find the marginal revenue at a production level of 10 units. 167) _____

A) $\frac{2}{3}(10)^{1/3} + (10)^{1/2} + 6$

B) $(10)^{2/3} + 2(10)^{1/2} + 6(10) + 2$

C) $\frac{2}{3}(10)^{-1/3} + (10)^{-1/2} + 6$

D) $\frac{2}{3}(10)^{-1/3} + (10)^{1/2} + 6$

E) $\frac{2}{3}(10)^{-1/3} + 4(10)^{-1/2} + 6$

168) If the profit function is $P(x) = \frac{5x^2}{3} + \frac{2}{3x} + 2x - 10$ for producing a product, find the marginal profit at a production level of 10 units. 168) _____

A) 423 B) 60 C) $\frac{5299}{150}$ D) $\frac{2651}{150}$ E) $\frac{252}{75}$

169) Find the average rate of change for $f(x) = -2x^2 + 5x - 2$ on $[-1, 1]$ 169) _____

A) 10 B) undefined C) 5 D) 3 E) 0

170) Find the average rate of change for $f(x) = -3x^2 - 2x + 5$ on $[-2, 1]$ 170) _____

A) 1 B) –3 C) 0 D) 3 E) – 7

171) Find the (instantaneous) velocity at time $t = 2$ seconds for a falling object where the height function is given by $h(t) = -16t^2 + 60t + 30$ in feet. 171) _____

A) 86 feet/second

B) 28 feet/second

C) –4 feet/second

D) 4 feet/second

E) –86 feet/second

172) What is the difference between the actual increase in profit as production increases from 5 to 6 units, and the marginal profit at a production level of 5 units where the profit function is given by $P(x) = 3x^2 - 5x + 2$? 172) _____

A) 0 B) 25 C) 3 D) 6 E) 27

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

173) A ball is thrown straight up. Its height, in feet, at time t, in seconds, is represented by the equation $h(t) = 30t - 16t^2 + 6$. Determine the instantaneous velocity of the ball at $t = 2$. 173) _____
Enter just an integer (no units)

174) A ball is thrown straight up. Its height, in feet, at time t, in seconds, is represented by the equation $h(t) = 20t - 16t^2 + 10$. Determine the maximum height of the ball. (Hint: Consider the velocity of the ball at the moment the ball reaches its maximum height.)

Enter just a reduced fraction of form $\frac{a}{b}$. No units. 174) _____

175) A point P is moving along the x–axis. At any time t, the location of P on the x–axis is described by $x = t^3 - 4t^2 + 3t$. Determine the point's instantaneous velocity when $t = 5$.
Enter just an integer. 175) _____

176) A point P is moving along the x–axis. At any time t, the location of P on the x–axis is described by $x = t^3 - 4t^2 + 3t$. Determine the instantaneous acceleration at time $t = 5$ of the point P. Enter just an integer. 176) _____

A rock is thrown off a cliff. Its distance from the ground below at t seconds is $s(t) = -16t^2 + 16t + 96$ feet.

177) What is the velocity after 1 second? Enter just an integer. No units. 177) _____

178) When will it hit the ground? Enter your answer exactly as: $t = a$. No units. 178) _____

179) What is the velocity of the rock when it slams into the ground? Enter just an integer. 179) _____

180) How high was the cliff? Enter just an integer, no units. 180) _____

A manufacturer's profit from producing x units of a product is given by $P(x) = 0.002x^3 - 0.01x^2 + 0.5x$.

181) What is the marginal profit when the production level is at 50 units?
Enter your answer as a real number to two decimal places, no units. 181) _____

182) At what production level(s) will the marginal profit be \$9.30 per unit?
Enter just an integer, no units. 182) _____

A winter storm front moves through campus. At t hours after the onset of the storm, the temperature is given by $T(t) = 35 - 2t^2 + t$.

183) What is the temperature 3 hours after the storm begins? Enter just an integer, no units. 183) _____

184) At what rate is the temperature changing 3 hours after the storm begins?
Enter just an integer, no units. 184) _____

Water is pouring into a tub such that after t minutes, there are $G(t) = t^3 - t^2 + 0.3t$ gallons in the tub.

185) What is the average rate at which water pours into the tub over the first 4 minutes?
Enter just a real number to one decimal place, no units. 185) _____

186) At what instantaneous rate is the water flowing when $t = 4$?
Enter your answer as just a real number to one decimal place, no units. 186) _____

An automobile's brakes are applied at time $t = 0$ when the vehicle is traveling at 48 ft/sec. The brakes cause the automobile to decelerate so that after t sec the velocity is given by $v(t) = 48 - 16t$.

187) At what rate is the vehicle decelerating after 1 sec? Enter just an integer, no units. 187) _____

188) How long will it take for the vehicle to come to a complete stop? 188) _____
Enter just an integer, no units.

Suppose that t hours after being placed in a freezer, the temperature of a piece of meat is given by $f(t) = 70 - 12t + \frac{4}{\quad}$.

189) What is the temperature of the meat after 3 hours? Enter just an integer, no units. 189) _____

190) How fast is the temperature of the meat falling 3 hours after being placed in the freezer? 190) _____
Enter your answer as a reduced fraction of the form $\frac{a}{b}$, no units.

1) A
2) B
3) B
4) D
5) A
6) C
7) A
8) B
9) A
10) B
11) C
12) D
13) –5
14) $-\frac{1}{2}$
15) $\frac{1}{2}$
16) $y = 3x + 5$
17) $y = \frac{3}{2}x + 0$
18) $y - 1 = \frac{-2}{3}\left(x - \frac{1}{2}\right)$
19) $y - 3 = \frac{5}{3}(x + 1)$
20) $y = \frac{8}{5}x - 2$
21) $y = -\frac{6}{5}x + \frac{1}{3}$
22) $y - 1 = -\frac{5}{7}\left(x + \frac{1}{2}\right)$
23) $y = -4$
24) 4, 10
25) C
26) D
27) B
28) D
29) A
30) $y - .81 = 1.8(x - .9)$
31) $y - \frac{49}{36} = \frac{7}{3}\left(x - \frac{7}{6}\right)$
32) $y - \frac{1}{9} = \frac{2}{3}\left(x - \frac{1}{3}\right)$
33) (2, 8), (–2, –8)
34) (3, 27), (–3, –27)
35) 2
36) $\frac{1}{5}$

37) C
38) A
39) B
40) B
41) C
42) D
43) $-10x^{-3}$
44) $5x^{1/4}$
45) $-2x^{-3}$
46) $-\frac{1}{2}x^{-3/2}$
47) $\frac{6}{5}x^{1/5}$
48) $\frac{2}{5}$
49) $g(1) = 4,\ g'(1) = 3$
50) $y - 4 = \frac{1}{3}(x - 8)$
51) -6
52) $\frac{1}{5}$
53) A
54) A
55) D
56) D
57) B
58) D
59) B
60) B
61) C
62) C
63) does not exist
64) does not exist
65) 6
66) $\frac{1}{2}$
67) 2
68) $\frac{2}{3}$
69) 108
70) 36
71) 0
72) -6
73) does not exist
74) 0
75) does not exist
76) 0
77) -2

78) does not exist

79) $\frac{3}{8}$

80) $\frac{5}{9}$

81) $-\frac{1}{18}$

82) 4

83) 0

84) 1

85) A

86) A

87) C

88) C

89) D

90) E

91) A

92) B

93) $x = -3$

94) $x = -3, -2, 1$

95) no.

96) yes

97) no.

98) $f(-7) = -12$

99) A

100) D

101) A

102) B

103) A

104) A

105) D

106) B

107) A

108) $\frac{15}{19}x^{-4/19}$

109) x^{-3}

110) $-15x^{-4}$

111) $\frac{1}{2}x^{\frac{-1}{2}}$

112) $-\frac{2x}{(x^2+5)^2}$

113) $\frac{3}{2}(3x+1)^{-1/2}$

114) $\frac{-2x}{(x^2+1)^2}$

115) $\frac{-24x}{(4x^2+1)^2}$

116) $-\frac{16}{(4x+1)^2}$

117) $\frac{dy}{dx}=\frac{15x}{\sqrt{5x^2+2}}$

118) $\frac{dy}{dx}=\frac{2x^3}{\sqrt{x^4+1}}$

119) $\frac{dy}{dx}=\frac{3x+2}{\sqrt{3x^2+4x}}$

120) $\frac{dy}{dx}=-2(2x+1)^{-3/2}$

121) $\frac{-36x^2-8x}{(3x^3+x^2+4)^2}$

122) $\frac{-1}{(2x+1)^{3/2}}$

123) 72

124) −7

125) 4

126) $y=-\frac{1}{16}x+\frac{3}{8}$

127) $-\frac{6}{125}$

128) 36

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

130) $y=-7x+26$

131) 18

132) $y=11x-2$

133) $y-6=15(x-2)$

134) 24

135) A

136) C

137) D

138) D

139) E

140) C

141) A

142) B

143) D

144) E

145) E

146) C

147) B

148) 21,875

149) $\frac{5}{2}$

150) $\frac{19}{8}$

151) $36\,x^2 - 24\,x$

152) –17,280

153) 0

154) 8

155) 422

156) $\frac{52}{3}$

157) $\frac{10}{\sqrt{14}}$

158) $-\frac{1}{16}$

159) $\frac{162}{625}$

160) $\frac{61}{2}$

161) $72x - 24$

162) $\frac{-16}{9}$

163) C

164) B

165) D

166) C

167) C

168) C

169) C

170) A

171) C

172) C

173) –34

174) $\frac{65}{4}$

175) 38

176) 22

177) –16

178) $t = 3$

179) 80

180) 96

181) 14.50

182) 40

183) 20

184) –11

185) 12.3

186) 40.3

187) 16
188) 3
189) 35
190) $-\frac{49}{4}$