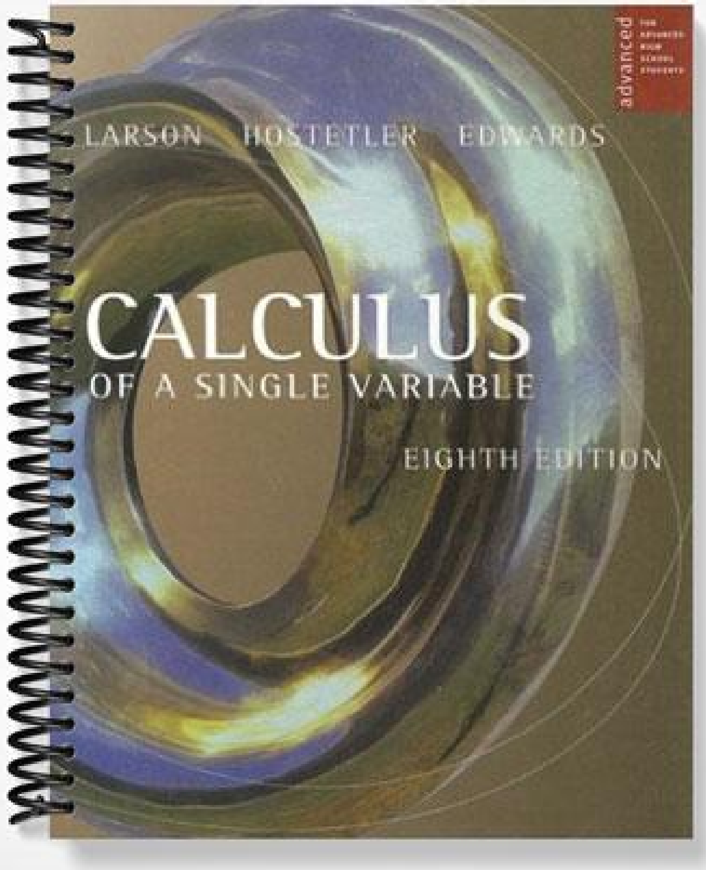
TEST BANK


advanced
LARSON HOSTETLER EDWARDS
CALCULUS
OF A SINGLE VARIABLE
EIGHTH EDITION

Chapter 2: Differentiation

Student: ____

1. Find the slope *m* of the line tangent to the graph of the function at the point .
A.
B.
C.
D.
E.

2. Find the slope *m* of the line tangent to the graph of the function at the point .
A.
B.
C.
D.
E.

3. Find the derivative of the function by the limit process.
A.
B.
C.
D.
E.

4. Find the derivative of the function by the limit process.
A.
B.
C.
D.
E.

5. Find the derivative of the following function using the limiting process.
A.
B.
C.
D.
E.

6. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

7. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

8. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

9. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

10. Find the derivative of the function using the limiting process.
A.
B.
C.
D.
E.

11. Find the derivative of the function by the limit process.
A.
B.
C.
D.
E.

12. Find an equation of the tangent line to the graph of the function at the point .
A.
B.
C.
D.
E.

13. Find an equation of the tangent line to the graph of the function at the point .
A.
B.
C.
D.
E.

14. Find an equation of the line that is tangent to the graph of the function and parallel to the line .
A.
B.
C.
D.
E.

15. Find an equation of the a line that is tangent to the graph of *f and* parallel to the given line.

A.
B.
C.
D.
E.

16. Find an equation of the line that is tangent to the graph of the function   and parallel to the line .
A.
B.
C.
D.
E.

17. The graph of the function *f* is given below. Select the graph of

A.

B.

C.

D.

E.

18. Identify the graph which has the following characteristics.

Graph 1	**Graph 2**	**Graph 3**	**Graph 4**

A. Graph 3
B. Graph 2
C. Graph 4
D. Graph 1
E. none of the others

19. Use the alternative form of the derivative to find the derivative of the function at .
A.
B.
C.
D.
E.

20. Use the alternative form of the derivative to find the derivative of the function at .
A.
B.
C.
D.
E.

21. Describe the *x*-values at which the graph of the function given below is differentiable.

A. is differentiable on the interval .
B. is differentiable on the interval .
C. is differentiable everywhere except at .
D. is differentiable everywhere except at .
E. is differentiable at .

22. Find the derivative of the function.

A.
B.
C.
D.
E.

23. Find the derivative of the function.

A.
B.
C.
D.
E.

24. Use the rules of differentiation to find the derivative of the function .
A.
B.
C.
D.
E.

25. Find the derivative of the function .
A.
B.
C.
D.
E.

26. Find the derivative of the function .
A.
B.
C.
D.
E.

27. Use the rules of differentiation to find the derivative of the function .
A.
B.
C.
D.
E.

28. Find the derivative of the function .
A.
B.
C.
D.
E.

29. Find the slope of the graph of the function at the given value.

when

A.

B.

C.

D.

E.

30. Find the slope of the graph of the function at the given value.

when

A.

B.

C.

D.

E.

31. Find the slope of the graph of the function at the given value.

when

A.

B.

C.

D.

E.

32. Find the slope of the graph of the function at .

A.

B.

C.

D.

E.

33. Find the slope of the graph of the function at the given value.

when

A.

B.

C.

D.

E.

34. Find the slope of the graph of the function at .
A.
B.
C.
D.
E.

35. Find the slope of the graph of the function at the given value.

when
A.
B.
C.
D.
E.

36. Find the derivative of the function .
A.
B.
C.
D.
E.

37. Find the derivative of the function .
A.
B.
C.
D.
E.

38. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

39. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

40. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

41. Suppose the position function for a free-falling object on a certain planet is given by is given by . A silver coin is dropped from the top of a building that is 1378 feet tall. Determine the velocity function for the coin.
A.
B.
C.
D.
E.

42. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1364 feet tall. Determine the average velocity of the coin over the time interval .
A. 14 ft/sec
B. 42 ft/sec
C. 42 ft/sec
D. 14 ft/sec
E. 48 ft/sec

43. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1380 feet tall. Find the instantaneous velocity of the coin when .
A. 33 ft/sec
B. 99 ft/sec
C. 19 ft/sec
D. 66 ft/sec
E. 30 ft/sec

44. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1368 feet tall. Find the time required for the coin to reach ground level. Round your answer to the three decimal places.
A. 2.642 sec
B. 9.550 sec
C. 2.466 sec
D. 9.327 sec
E. 9.885 sec

45. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1366 feet tall. Find velocity of the coin at impact. Round your answer to the three decimal places.
A. 128.031 ft/sec
B. 256.062 ft/sec
C. 110.878 ft/sec
D. 266.518 ft/sec
E. 238.062 ft/sec

46. A ball is thrown straight down from the top of a 250-ft building with an initial velocity of 12 ft per second. The position function is . What is the velocity of the ball after 2 seconds?
A. The velocity after 2 seconds is 152 ft per second.
B. The velocity after 2 seconds is 52 ft per second.
C. The velocity after 2 seconds is 76 ft per second.
D. The velocity after 2 seconds is 20 ft per second..
E. The velocity after 2 seconds is 44 ft per second.

47. A projectile is shot upwards from the surface of the earth with an initial velocity of 118 meters per second. The position function is .

What is its velocity after 6 seconds?
A. The velocity after 6 seconds is 88.6 meters per second.
B. The velocity after 6 seconds is 147.4 meters per second.
C. The velocity after 6 seconds is 176.8 meters per second.
D. The velocity after 6 seconds is 59.2 meters per second.
E. The velocity after 6 seconds is 206.6 meters per second.

48. The volume of a cube with sides of length *s* is given by . Find the rate of change of volume with respect to *s* when centimeters.
A. 588 cm^2

B. 196 cm^2

C. 2744 cm^2

D. 392 cm^2

E. 8232 cm^2

49. Find the derivative of the algebraic function .
A.
B.
C.
D.
E.

50. Use the Product Rule to differentiate .
A.
B.
C.
D.
E.

51. Use the Product Rule to differentiate .
A.
B.
C.
D.
E.

52. Use the Product Rule to differentiate.

A.
B.
C.
D.
E.

53. Use the Product Rule to differentiate .
A.
B.
C.
D.
E.

54. Use the Quotient Rule to differentiate the function .
A.
B.
C.
D.
E.

55. Use the Quotient Rule to differentiate the function .
A.
B.
C.
D.
E.

56. Use the Quotient Rule to differentiate .
A.
B.
C.
D.
E.

57. Use the quotient rule to differentiate the following function and evaluate .
A.
B.
C.
D.
E.

58. Find the derivative of the algebraic function .
A.
B.
C.
D.
E.

59. Find the derivative of the function .
A.
B.
C.
D.
E.

60. Find the derivative of the function .
A.
B.
C.
D.
E.

61. Find the derivative of the function . Simplify your answer.
A.
B.
C.
D.
E.

62. Find the derivative of the function.

A.
B.
C.
D.
E.

63. Find the derivative of the trigonometric function .
A.
B.
C.
D.
E.

64. Find the derivative of the function.

A.
B.
C.
D.
E.

65. Find an equation of the tangent line to the graph of *f* at the given point.

at
A.
B.
C.
D.
E.

66. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

67. The length of a rectangle is and its height is , where *t* is time in seconds and the dimensions are in inches. Find the rate of change of area, *A*, with respect to time.
A. square inches/second
B. square inches/second
C. square inches/second
D. square inches/second
E. square inches/second

68. The radius of a right circular cylinder is and its height is , where *t* is time in seconds and the dimensions are in inches. Find the rate of change of the volume of the cylinder, *V*, with respect to time.

A. cubic inches per second
B. cubic inches per second
C. cubic inches per second
D. cubic inches per second
E. cubic inches per second

69. The ordering and transportation cost *C* for the components used in manufacturing a product is where *C* is measured in thousands of dollars and *x* is the order size in hundreds. Find the rate of change of *C* with respect to *x* for *x* = 24. Round your answer to two decimal places.

A. 8.24 thousand dollars per hundred
B. 4.17 thousand dollars per hundred
C. 6.40 thousand dollars per hundred
D. 10.39 thousand dollars per hundred
E. 10.15 thousand dollars per hundred

70. A population of 340 bacteria is introduced into a culture and grows in number according to the equation where *t* is measured in hours. Find the rate at which the population is growing when *t* = 2. Round your answer to two decimal places.

A. 28.19 bacteria per hour
B. 29.31 bacteria per hour
C. 30.36 bacteria per hour
D. 134.42 bacteria per hour
E. 25.27 bacteria per hour

71. When satellites observe Earth, they can scan only part of Earth's surface. Some satellites have sensors that can measure the angle shown in the figure. Let *h* represent the satellite's distance from Earth's surface and let *r* represent Earth's radius. Find the rate at which *h* is changing with respect to when (Assume *r* = 3170 miles.) Round your answer to the nearest unit.

A. 2113 mi/radian
B. 2113 mi/radian
C. 3660 mi/radian
D. 3660 mi/radian
E. 6340 mi/radian

72. Find the second derivative of the function .
A.
B.
C.
D.
E.

73. Find the second derivative of the function .
A.
B.
C.
D.
E.

74. Find the second derivative of the function .
A.
B.
C.
D.
E.

75. Given the derivative below find the requested higher-order derivative.

,
A.
B.
C.
D.
E.

76. Suppose that an automobile's velocity starting from rest is where *v* is measured in feet per second. Find the acceleration at 5 seconds. Round your answer to one decimal place.
A. 13.3 ft/sec^2

B. 0.8 ft/sec^2

C. 1.8 ft/sec^2

D. 2.7 ft/sec^2

E. 0.4 ft/sec^2

77. Find the derivative of the algebraic function .
A.
B.
C.
D.
E.

78. Find the derivative of the function.

A.
B.
C.
D.
E.

79. Find the derivative of the function.

A.
B.
C.
D.
E.

80. Find the derivative of the function.

A.
B.
C.
D.
E.

81. Find the derivative of the function.

A.
B.
C.
D.
E.

82. Find the derivative of the function.

A.
B.
C.
D.
E.

83. Find the derivative of the function .
A.
B.
C.
D.
E.

84. Find the derivative of the function .
A.
B.
C.
D.
E.

85. Find the derivative of the function.

A.
B.
C.
D.
E.

86. Find the derivative of the function.

A.
B.
C.
D.
E.

87. Find the derivative of the function.

A.
B.
C.
D.
E.

88. Find the derivative of the function.

A.
B.
C.
D.
E.

89. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

90. Evaluate the derivative of the function at the given point.

,
A.
B.
C.
D.
E.

91. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

92. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

93. Find an equation to the tangent line for the graph of *f* at the given point.

,
A.
B.
C.
D.
E.

94. Find an equation to the tangent line to the graph of the function at the point . The coefficients below are given to two decimal places.
A.
B.
C.
D.
E.

95. Find the second derivative of the function.

A.
B.
C.
D.
E.

96. Find the second derivative of the function .
A.
B.
C.
D.
E.

97. The displacement from equilibrium of an object in harmonic motion on the end of a spring is where *y* is measured in feet and *t* is the time in seconds. Determine the position of the object when Round your answer to two decimal places.
A. 0.33 feet
B. 10.28 feet
C. 0.12 feet
D. 0.68 feet
E. 0.47 feet

98. The displacement from equilibrium of an object in harmonic motion on the end of a spring is where *y* is measured in feet and *t* is the time in seconds. Determine the velocity of the object when . Round your answer to two decimal places.
A. 1.64 ft/sec
B. 6.36 ft/sec
C. 8.32 ft/sec
D. 2.23 ft/sec
E. 6.32 ft/sec

99. Suppose a 15-centimeter pendulum moves according to the equation where is the angular displacement from the vertical in radians and *t* is the time in seconds. Determine the rate of change of when $t = 21$ seconds. Round your answer to four decimal places.
A. 0.8975 radians per second
B. 7.9774 radians per second
C. 6.0239 radians per second
D. 8.2947 radians per second
E. 7.1796 radians per second

100. A buoy oscillates in simple harmonic motion as waves move past it. The buoy moves a total of 7.5 feet (vertically) between its low point and its high point. It returns to its high point every 14 seconds. Write an equation describing the motion of the buoy if it is at its high point at $t = 0$.
A.
B.
C.
D.
E.

101. A buoy oscillates in simple harmonic motion as waves move past it. The buoy moves a total of 7.5 feet (vertically) between its low point and its high point. It returns to its high point every 30 seconds. Determine the velocity of the buoy as a function of *t*.
A.
B.
C.
D.
E.

102. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

103. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

104. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

105. Find by implicit differentiation given that
A.
B.
C.
D.
E.

106. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

107. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

108. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

109. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

110. Find by implicit differentiation given that
A.
B.
C.
D.
E.

111. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

112. Find by implicit differentiation given that Use the original equation to simplify your answer.
A.
B.
C.
D.
E.

113. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

114. Find the slope of the tangent line at the given point Round your answer to two decimal places.
A. 0.67
B. 3.00
C. 2.00
D. 1.00
E. 1.67

115. Find an equation of the tangent line to the graph of the function at the point .The coefficients below are given to two decimal places.
A.
B.
C.
D.
E.

116. Find an equation of the tangent line to the graph of the function given below at the given point.

,

(The coefficients below are given to two decimal places.)
A.
B.
C.
D.
E.

117. Use implicit differentiation to find an equation of the tangent line to the ellipse
A.
B.
C.
D.
E.

118. Find in terms of *x* and *y* given that Use the original equation to simplify your answer.
A.
B.
C.
D.
E.

119. Find d^2y/dx^2 in terms of *x* and *y*.

A.
B.
C.
D.
E.

120. Find in terms of *x* and *y* given that
A.
B.
C.
D.
E.

121. Find d^2y/dx^2 in terms of *x* and *y*.

A.
B.
C.
D.
E.

122. Find the points at which the graph of the equation has a vertical or horizontal tangent line.

A. There is a horizontal tangent at but no vertical tangents.
B. There is a horizontal tangent at and a vertical tangent at .
C. There is a vertical tangent at but no horizontal tangents.
D. There is a horizontal tangent at and a vertical tangent at .
E. There are no horizontal or vertical tangent lines.

123. Differentiate with respect to *t* (*x* and *y* are functions of *t*).
A.
B.
C.
D.
E.

124. Differentiate with respect to *t* (*x* and *y* are functions of *t*).
A.
B.
C.
D.
E.

125. Assume that *x* and *y* are both differentiable functions of *t* . Find for the equation
A.
B.
C.
D.
E.

126. Assume that *x* and *y* are both differentiable functions of *t*. Find for the equation
A.
B.
C.
D.
E.

127. A point is moving along the graph of the function

such that *dx/dt* = 2 centimeters per second.

Find *dy/dt* when.
A.
B.
C.
D.
E.

128. A point is moving along the graph of the function

such that *dx/dt* = 6 centimeters per second.

Find *dy/dt* when .
A.
B.
C.
D.
E.

129. Find the rate of change of the distance *D* between the origin and a moving point on the graph of if centimeters per second.
A.
B.
C.
D.
E.

130. The radius, *r*, of a circle is increasing at a rate of 5 centimeters per minute.

Find the rate of change of area, *A*, when the radius is .
A. sq cm/min
B. sq cm/min
C. sq cm/min
D. sq cm/min
E. sq cm/min

131. The radius *r* of a sphere is increasing at a rate of 2 inches per minute. Find the rate of change of the volume when *r* = 9 inches.
A.
B.
C.
D.
E.

132. A spherical balloon is inflated with gas at the rate of 400 cubic centimeters per minute. How fast is the radius of the balloon increasing at the instant the radius is 30 centimeters?
A.
B.
C.
D.
E.

133. All edges of a cube are expanding at a rate of 6 centimeters per second. How fast is the volume changing when each edge is 4 centimeters?
A. 96 cm^3/sec
B. 288 cm^3/sec
C. 192 cm^3/sec
D. 432 cm^3/sec
E. 144 cm^3/sec

134. A conical tank (with vertex down) is 14 feet across the top and 20 feet deep. If water is flowing into the tank at a rate of 12 cubic feet per minute, find the rate of change of the depth of the water when the water is 10 feet deep.
A.
B.
C.
D.
E.

135. A ladder 20 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 4 feet per second. How fast is the top of the ladder moving down the wall when its base is 13 feet from the wall? Round your answer to two decimal places.

A. 6.86 ft/sec
B. 7.00 ft/sec
C. 3.42 ft/sec
D. 5.00 ft/sec
E. 6.86 ft/sec

136. A ladder 20 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 4 feet per second. Consider the triangle formed by the side of the house, the ladder, and the ground. Find the rate at which the area of the triangle is changed when the base of the ladder is 7 feet from the wall. Round your answer to two decimal places.

A. ft^2/sec
B. ft^2/sec
C. ft^2/sec
D. ft^2/sec
E. ft^2/sec

137. A ladder 25 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 2 feet per second. Find the rate at which the angle between the ladder and the wall of the house is changing when the base of the ladder is 7 feet from the wall. Round your answer to three decimal places.

A. 2.151 rad/sec
B. 0.086 rad/sec
C. 0.102 rad/sec
D. 2.180 rad/sec
E. 0.267 rad/sec

138. A man 6 feet tall walks at a rate of 13 feet per second away from a light that is 15 feet above the ground (see figure). When he is 5 feet from the base of the light, at what rate is the tip of his shadow moving?

A.
B.
C.
D.
E.

139. A man 6 feet tall walks at a rate of 2 feet per second away from a light that is 15 feet above the ground (see figure). When he is 5 feet from the base of the light, at what rate is the length of his shadow changing?

A.
B.
C.
D.
E.

140. A man 5 feet tall walks at a rate of 3 ft per second away from a light that is 16 ft above the ground (see figure). When he is 10 ft from the base of the light, find the rate.at which the tip of his shadow is moving.

A. ft per minute
B. ft per minute
C. ft per minute
D. ft per minute
E. ft per minute

141. An airplane is flying in still air with an airspeed of 277 miles per hour. If it is climbing at an angle of find the rate at which it is gaining altitude. Round your answer to four decimal places.
A. 134.2923 mi/hr
B. 99.2679 mi/hr
C. 112.6661 mi/hr
D. 125.7554 mi/hr
E. 113.8863 mi/hr

Chapter 2: Differentiation Key

1. Find the slope *m* of the line tangent to the graph of the function at the point .

A.
B.
C.
D.
E.

2. Find the slope *m* of the line tangent to the graph of the function at the point .

A.
B.
C.
D.
E.

3. Find the derivative of the function by the limit process.

A.
B.
C.
D.
E.

4. Find the derivative of the function by the limit process.

A.
B.
C.
D.
E.

5. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

6. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

7. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

8. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

9. Find the derivative of the following function using the limiting process.

A.
B.
C.
D.
E.

10. Find the derivative of the function using the limiting process.
A.
B.
C.
D.
E.

11. Find the derivative of the function by the limit process.
A.
B.
C.
D.
E.

12. Find an equation of the tangent line to the graph of the function at the point .
A.
B.
C.
D.
E.

13. Find an equation of the tangent line to the graph of the function at the point .
A.
B.
C.
D.
E.

14. Find an equation of the line that is tangent to the graph of the function and parallel to the line .
A.
B.
C.
D.
E.

15. Find an equation of the a line that is tangent to the graph of *f and* parallel to the given line.

A.
B.
C.
D.
E.

16. Find an equation of the line that is tangent to the graph of the function and parallel to the line .

A.
B.
C.
D.
E.

17. The graph of the function *f* is given below. Select the graph of

A.

B.

C.

D.

E.

18. Identify the graph which has the following characteristics.

Graph 1	Graph 2	Graph 3	Graph 4

A. Graph 3
B. Graph 2
C. Graph 4
D. Graph 1
E. none of the others

19. Use the alternative form of the derivative to find the derivative of the function at .
A.
B.
C.
D.
E.

20. Use the alternative form of the derivative to find the derivative of the function at .
A.
B.
C.
D.
E.

21. Describe the *x*-values at which the graph of the function given below is differentiable.

A. is differentiable on the interval .
B. is differentiable on the interval .
C. is differentiable everywhere except at .
D. is differentiable everywhere except at .
E. is differentiable at .

22. Find the derivative of the function.

A.
B.
C.
D.
E.

23. Find the derivative of the function.

A.
B.
C.
D.
E.

24. Use the rules of differentiation to find the derivative of the function .
A.
B.
C.
D.
E.

25. Find the derivative of the function .
A.
B.
C.
D.
E.

26. Find the derivative of the function .
A.
B.
C.
D.
E.

27. Use the rules of differentiation to find the derivative of the function .
A.
B.
C.
D.
E.

28. Find the derivative of the function .
A.
B.
C.
D.
E.

29. Find the slope of the graph of the function at the given value.

when

A.
B.
C.
D.
E.

30. Find the slope of the graph of the function at the given value.

when

A.
B.
C.
D.
E.

31. Find the slope of the graph of the function at the given value.

when

A.
B.
C.
D.
E.

32. Find the slope of the graph of the function at .

A.
B.
C.
D.
E.

33. Find the slope of the graph of the function at the given value.

when

A.
B.
C.
D.
E.

34. Find the slope of the graph of the function at .
A.
B.
C.
D.
E.

35. Find the slope of the graph of the function at the given value.

when
A.
B.
C.
D.
E.

36. Find the derivative of the function .
A.
B.
C.
D.
E.

37. Find the derivative of the function .
A.
B.
C.
D.
E.

38. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

39. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

40. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

41. Suppose the position function for a free-falling object on a certain planet is given by is given by . A silver coin is dropped from the top of a building that is 1378 feet tall. Determine the velocity function for the coin.
A.
B.
C.
D.
E.

42. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1364 feet tall. Determine the average velocity of the coin over the time interval .
A. 14 ft/sec
B. 42 ft/sec
C. 42 ft/sec
D. 14 ft/sec
E. 48 ft/sec

43. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1380 feet tall. Find the instantaneous velocity of the coin when .
A. 33 ft/sec
B. 99 ft/sec
C. 19 ft/sec
D. 66 ft/sec
E. 30 ft/sec

44. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1368 feet tall. Find the time required for the coin to reach ground level. Round your answer to the three decimal places.
A. 2.642 sec
B. 9.550 sec
C. 2.466 sec
D. 9.327 sec
E. 9.885 sec

45. Suppose the position function for a free-falling object on a certain planet is given by . A silver coin is dropped from the top of a building that is 1366 feet tall. Find velocity of the coin at impact. Round your answer to the three decimal places.
A. 128.031 ft/sec
B. 256.062 ft/sec
C. 110.878 ft/sec
D. 266.518 ft/sec
E. 238.062 ft/sec

46. A ball is thrown straight down from the top of a 250-ft building with an initial velocity of 12 ft per second. The position function is . What is the velocity of the ball after 2 seconds?
A. The velocity after 2 seconds is 152 ft per second.
B. The velocity after 2 seconds is 52 ft per second.
C. The velocity after 2 seconds is 76 ft per second.
D. The velocity after 2 seconds is 20 ft per second..
E. The velocity after 2 seconds is 44 ft per second.

47. A projectile is shot upwards from the surface of the earth with an initial velocity of 118 meters per second. The position function is .

What is its velocity after 6 seconds?
A. The velocity after 6 seconds is 88.6 meters per second.
B. The velocity after 6 seconds is 147.4 meters per second.
C. The velocity after 6 seconds is 176.8 meters per second.
D. The velocity after 6 seconds is 59.2 meters per second.
E. The velocity after 6 seconds is 206.6 meters per second.

48. The volume of a cube with sides of length *s* is given by . Find the rate of change of volume with respect to *s* when centimeters.

A. 588 cm^2

B. 196 cm^2

C. 2744 cm^2

D. 392 cm^2

E. 8232 cm^2

49. Find the derivative of the algebraic function .

A.
B.
C.
D.
E.

50. Use the Product Rule to differentiate .

A.
B.
C.
D.
E.

51. Use the Product Rule to differentiate .

A.
B.
C.
D.
E.

52. Use the Product Rule to differentiate.

A.
B.
C.
D.
E.

53. Use the Product Rule to differentiate .
A.
B.
C.
D.
E.

54. Use the Quotient Rule to differentiate the function .
A.
B.
C.
D.
E.

55. Use the Quotient Rule to differentiate the function .
A.
B.
C.
D.
E.

56. Use the Quotient Rule to differentiate .
A.
B.
C.
D.
E.

57. Use the quotient rule to differentiate the following function and evaluate .
A.
B.
C.
D.
E.

58. Find the derivative of the algebraic function .
A.
B.
C.
D.
E.

59. Find the derivative of the function .
A.
B.
C.
D.
E.

60. Find the derivative of the function .
A.
B.
C.
D.
E.

61. Find the derivative of the function . Simplify your answer.
A.
B.
C.
D.
E.

62. Find the derivative of the function.

A.
B.
C.
D.
E.

63. Find the derivative of the trigonometric function .
A.
B.
C.
D.
E.

64. Find the derivative of the function.

A.
B.
C.
D.
E.

65. Find an equation of the tangent line to the graph of *f* at the given point.

at
A.
B.
C.
D.
E.

66. Determine all values of *x*, (if any), at which the graph of the function has a horizontal tangent.

A.
B. and
C. and
D.
E. The graph has no horizontal tangents.

67. The length of a rectangle is and its height is , where *t* is time in seconds and the dimensions are in inches. Find the rate of change of area, *A*, with respect to time.
A. square inches/second
B. square inches/second
C. square inches/second
D. square inches/second
E. square inches/second

68. The radius of a right circular cylinder is and its height is , where *t* is time in seconds and the dimensions are in inches. Find the rate of change of the volume of the cylinder, *V*, with respect to time.
A. cubic inches per second
B. cubic inches per second
C. cubic inches per second
D. cubic inches per second
E. cubic inches per second

69. The ordering and transportation cost *C* for the components used in manufacturing a product is where *C* is measured in thousands of dollars and *x* is the order size in hundreds. Find the rate of change of *C* with respect to *x* for *x* = 24. Round your answer to two decimal places.
A. 8.24 thousand dollars per hundred
B. 4.17 thousand dollars per hundred
C. 6.40 thousand dollars per hundred
D. 10.39 thousand dollars per hundred
E. 10.15 thousand dollars per hundred

70. A population of 340 bacteria is introduced into a culture and grows in number according to the equation where *t* is measured in hours. Find the rate at which the population is growing when *t* = 2. Round your answer to two decimal places.
A. 28.19 bacteria per hour
B. 29.31 bacteria per hour
C. 30.36 bacteria per hour
D. 134.42 bacteria per hour
E. 25.27 bacteria per hour

71. When satellites observe Earth, they can scan only part of Earth's surface. Some satellites have sensors that can measure the angle shown in the figure. Let *h* represent the satellite's distance from Earth's surface and let *r* represent Earth's radius. Find the rate at which *h* is changing with respect to when (Assume *r* = 3170 miles.) Round your answer to the nearest unit.

A. 2113 mi/radian
B. 2113 mi/radian
C. 3660 mi/radian
D. 3660 mi/radian
E. 6340 mi/radian

72. Find the second derivative of the function .
A.
B.
C.
D.
E.

73. Find the second derivative of the function .
A.
B.
C.
D.
E.

74. Find the second derivative of the function .
A.
B.
C.
D.
E.

75. Given the derivative below find the requested higher-order derivative.

,
A.
B.
C.
D.
E.

76. Suppose that an automobile's velocity starting from rest is where *v* is measured in feet per second. Find the acceleration at 5 seconds. Round your answer to one decimal place.
A. 13.3 ft/sec^2

B. 0.8 ft/sec^2

C. 1.8 ft/sec^2

D. 2.7 ft/sec^2

E. 0.4 ft/sec^2

77. Find the derivative of the algebraic function .
A.
B.
C.
D.
E.

78. Find the derivative of the function.

A.
B.
C.
D.
E.

79. Find the derivative of the function.

A.
B.
C.
D.
E.

80. Find the derivative of the function.

A.
B.
C.
D.
E.

81. Find the derivative of the function.

A.
B.
C.
D.
E.

82. Find the derivative of the function.

A.
B.
C.
D.
E.

83. Find the derivative of the function .
A.
B.
C.
D.
E.

84. Find the derivative of the function .
A.
B.
C.
D.
E.

85. Find the derivative of the function.

A.
B.
C.
D.
E.

86. Find the derivative of the function.

A.
B.
C.
D.
E.

87. Find the derivative of the function.

A.
B.
C.
D.
E.

88. Find the derivative of the function.

A.
B.
C.
D.
E.

89. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

90. Evaluate the derivative of the function at the given point.

,
A.
B.
C.
D.
E.

91. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

92. Evaluate the derivative of the function at the point .
A.
B.
C.
D.
E.

93. Find an equation to the tangent line for the graph of *f* at the given point.

,
A.
B.
C.
D.
E.

94. Find an equation to the tangent line to the graph of the function at the point . The coefficients below are given to two decimal places.
A.
B.
C.
D.
E.

95. Find the second derivative of the function.

A.
B.
C.
D.
E.

96. Find the second derivative of the function .
A.
B.
C.
D.
E.

97. The displacement from equilibrium of an object in harmonic motion on the end of a spring is where *y* is measured in feet and *t* is the time in seconds. Determine the position of the object when Round your answer to two decimal places.
A. 0.33 feet
B. 10.28 feet
C. 0.12 feet
D. 0.68 feet
E. 0.47 feet

98. The displacement from equilibrium of an object in harmonic motion on the end of a spring is where *y* is measured in feet and *t* is the time in seconds. Determine the velocity of the object when . Round your answer to two decimal places.
A. 1.64 ft/sec
B. 6.36 ft/sec
C. 8.32 ft/sec
D. 2.23 ft/sec
E. 6.32 ft/sec

99. Suppose a 15-centimeter pendulum moves according to the equation where is the angular displacement from the vertical in radians and *t* is the time in seconds. Determine the rate of change of when $t = 21$ seconds. Round your answer to four decimal places.
A. 0.8975 radians per second
B. 7.9774 radians per second
C. 6.0239 radians per second
D. 8.2947 radians per second
E. 7.1796 radians per second

100. A buoy oscillates in simple harmonic motion as waves move past it. The buoy moves a total of 7.5 feet (vertically) between its low point and its high point. It returns to its high point every 14 seconds. Write an equation describing the motion of the buoy if it is at its high point at $t = 0$.
A.
B.
C.
D.
E.

101. A buoy oscillates in simple harmonic motion as waves move past it. The buoy moves a total of 7.5 feet (vertically) between its low point and its high point. It returns to its high point every 30 seconds. Determine the velocity of the buoy as a function of *t*.
A.
B.
C.
D.
E.

102. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

103. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

104. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

105. Find by implicit differentiation given that
A.
B.
C.
D.
E.

106. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

107. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

108. Find *dy/dx* by implicit differentiation.

A.
B.
C.
D.
E.

109. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

110. Find by implicit differentiation given that
A.
B.
C.
D.
E.

111. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

112. Find by implicit differentiation given that Use the original equation to simplify your answer.
A.
B.
C.
D.
E.

113. Evaluate for the equation at the given point Round your answer to two decimal places.
A.
B.
C.
D.
E.

114. Find the slope of the tangent line at the given point Round your answer to two decimal places.
A. 0.67
B. 3.00
C. 2.00
D. 1.00
E. 1.67

115. Find an equation of the tangent line to the graph of the function at the point .The coefficients below are given to two decimal places.
A.
B.
C.
D.
E.

116. Find an equation of the tangent line to the graph of the function given below at the given point.

,

(The coefficients below are given to two decimal places.)
A.
B.
C.
D.
E.

117. Use implicit differentiation to find an equation of the tangent line to the ellipse
A.
B.
C.
D.
E.

118. Find in terms of *x* and *y* given that Use the original equation to simplify your answer.
A.
B.
C.
D.
E.

119. Find d^2y/dx^2 in terms of *x* and *y*.

A.
B.
C.
D.
E.

120. Find in terms of *x* and *y* given that
A.
B.
C.
D.
E.

121. Find d^2y/dx^2 in terms of x and y.

A.
B.
C.
D.
E.

122. Find the points at which the graph of the equation has a vertical or horizontal tangent line.

A. There is a horizontal tangent at but no vertical tangents.
B. There is a horizontal tangent at and a vertical tangent at .
C. There is a vertical tangent at but no horizontal tangents.
D. There is a horizontal tangent at and a vertical tangent at .
E. There are no horizontal or vertical tangent lines.

123. Differentiate with respect to t (x and y are functions of t).
A.
B.
C.
D.
E.

124. Differentiate with respect to t (x and y are functions of t).
A.
B.
C.
D.
E.

125. Assume that x and y are both differentiable functions of t . Find for the equation
A.
B.
C.
D.
E.

126. Assume that *x* and *y* are both differentiable functions of *t*. Find for the equation
A.
B.
C.
D.
E.

127. A point is moving along the graph of the function

such that *dx/dt* = 2 centimeters per second.

Find *dy/dt* when.
A.
B.
C.
D.
E.

128. A point is moving along the graph of the function

such that *dx/dt* = 6 centimeters per second.

Find *dy/dt* when .
A.
B.
C.
D.
E.

129. Find the rate of change of the distance *D* between the origin and a moving point on the graph of if centimeters per second.
A.
B.
C.
D.
E.

130. The radius, *r*, of a circle is increasing at a rate of 5 centimeters per minute.

Find the rate of change of area, *A*, when the radius is .

A. sq cm/min
B. sq cm/min
C. sq cm/min
D. sq cm/min
E. sq cm/min

131. The radius *r* of a sphere is increasing at a rate of 2 inches per minute. Find the rate of change of the volume when $r = 9$ inches.

A.
B.
C.
D.
E.

132. A spherical balloon is inflated with gas at the rate of 400 cubic centimeters per minute. How fast is the radius of the balloon increasing at the instant the radius is 30 centimeters?

A.
B.
C.
D.
E.

133. All edges of a cube are expanding at a rate of 6 centimeters per second. How fast is the volume changing when each edge is 4 centimeters?

A. 96 cm^3/sec
B. 288 cm^3/sec
C. 192 cm^3/sec
D. 432 cm^3/sec
E. 144 cm^3/sec

134. A conical tank (with vertex down) is 14 feet across the top and 20 feet deep. If water is flowing into the tank at a rate of 12 cubic feet per minute, find the rate of change of the depth of the water when the water is 10 feet deep.

A.
B.
C.
D.
E.

135. A ladder 20 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 4 feet per second. How fast is the top of the ladder moving down the wall when its base is 13 feet from the wall? Round your answer to two decimal places.

A. 6.86 ft/sec
B. 7.00 ft/sec
C. 3.42 ft/sec
D. 5.00 ft/sec
E. 6.86 ft/sec

136. A ladder 20 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 4 feet per second. Consider the triangle formed by the side of the house, the ladder, and the ground. Find the rate at which the area of the triangle is changed when the base of the ladder is 7 feet from the wall. Round your answer to two decimal places.

A. ft^2/sec
B. ft^2/sec
C. ft^2/sec
D. ft^2/sec
E. ft^2/sec

137. A ladder 25 feet long is leaning against the wall of a house (see figure). The base of the ladder is pulled away from the wall at a rate of 2 feet per second. Find the rate at which the angle between the ladder and the wall of the house is changing when the base of the ladder is 7 feet from the wall. Round your answer to three decimal places.

A. 2.151 rad/sec
B. 0.086 rad/sec
C. 0.102 rad/sec
D. 2.180 rad/sec
E. 0.267 rad/sec

138. A man 6 feet tall walks at a rate of 13 feet per second away from a light that is 15 feet above the ground (see figure). When he is 5 feet from the base of the light, at what rate is the tip of his shadow moving?

A.
B.
C.
D.
E.

139. A man 6 feet tall walks at a rate of 2 feet per second away from a light that is 15 feet above the ground (see figure). When he is 5 feet from the base of the light, at what rate is the length of his shadow changing?

A.
B.
C.
D.
E.

140. A man 5 feet tall walks at a rate of 3 ft per second away from a light that is 16 ft above the ground (see figure). When he is 10 ft from the base of the light, find the rate.at which the tip of his shadow is moving.

A. ft per minute
B. ft per minute
C. ft per minute
D. ft per minute
E. ft per minute

141. An airplane is flying in still air with an airspeed of 277 miles per hour. If it is climbing at an angle of find the rate at which it is gaining altitude. Round your answer to four decimal places.
A. 134.2923 mi/hr
B. 99.2679 mi/hr
C. 112.6661 mi/hr
D. 125.7554 mi/hr
E. 113.8863 mi/hr