

**Test Bank for Applied Calculus for Business Economics and
the Social and Life Sciences 11th Edition Hoffmann Bradley
Sobecki and Price 0073532371 9780073532370**

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Chapter 2

1. The equation of the line tangent to the graph of $f(x) = x^2 + 3x$ at $x = 2$ is

A) $y = 7x - 4$ B) $y = 7x - 422$ C) $y = 7x - 2$ D) $y = 7x - 144$

Ans: A Difficulty: moderate Section: 2.1

2. The equation of the line tangent to the graph of $f(x) = x^2 + 4x$ at $x = 3$ is

A) $y = 10x - 9$ B) $y = 10x - 108$ C) $y = 10x - 3$ D) $y = 10x - 27$

Ans: A Difficulty: moderate Section: 2.1

3. The equation of the line tangent to the graph of $f(x) = 3\sqrt{x}$ at $x = 1$ is

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

Ans: C Difficulty: moderate Section: 2.1

4. For $f(x) = 5 - x^2$, find the slope of the secant line connecting the points whose x -coordinates are $x = -6$ and $x = -5.9$. Then use calculus to find the slope of the line that is tangent to the graph of f at $x = -6$.

Ans: Slope of secant line: 11.9; Slope of tangent line: 12

Difficulty: moderate Section: 2.1

5. For $f(x) = -\frac{3}{\sqrt{x}}$, find the average rate of change of $f(x)$ with respect to x as x changes

from 144 to 145. Then use calculus to find the instantaneous rate of change at $x = 144$. Round your answer to six decimal places, if necessary.

A) Average rate of change: 0.000864; Instantaneous rate of change: -0.125

B) Average rate of change: -0.000864 ; Instantaneous rate of change: 0.000868

C) Average rate of change: -0.000864 ; Instantaneous rate of change: 0.125

D) Average rate of change: 0.000864; Instantaneous rate of change: 0.000868

Ans: D Difficulty: hard Section: 2.1

6. If $f(x)$ represents the price per barrel of oil in terms of time, what does $\frac{f(x_0+h)-f(x_0)}{h}$

represent? What about $\lim_{h \rightarrow 0} \frac{f(x_0+h)-f(x_0)}{h}$?

Ans: The average rate of change of oil price with respect to time on the time interval $[x_0, x_0 + h]$; the instantaneous rate of change of oil price with respect to time at time x_0 .

Difficulty: easy Section: 2.1

7. True or False: Differentiating $f(x) = x^3 - 3x + 1$ gives $3x^2$.

A) True B) False

Ans: B Difficulty: easy Section: 2.2

8. True or False: Differentiating $f(x) = x^6 - 4x + 2$ gives $6x^5$.

A) True B) False

Ans: B Difficulty: easy Section: 2.2

9. Differentiate: $f(x) = x^8 + 2$

A) $8x^7 + 2$ B) $8x^9 + 2x$ C) $8x^7$ D) $7x^7$

Ans: C Difficulty: easy Section: 2.2

10. Differentiate: $f(x) = x^8 + 7$

A) $8x^7$ B) $8x^7 + 7$ C) $8x^9 + 7x$ D) $7x^7$

Ans: A Difficulty: easy Section: 2.2

11. True or False: Differentiating $f(x) = \frac{1}{3}x^7 - 2x^5 + 9x - 8$ gives $\frac{7x^6}{3} - 10x^4 + 9$.

A) True B) False

Ans: A Difficulty: easy Section: 2.2

12. True or False: Differentiating $f(x) = \frac{1}{4}x^7 - 5x^3 + 3x - 5$ gives $\frac{7}{4}x^6 - 15x^2 + 3$.

A) True B) False

Ans: A Difficulty: easy Section: 2.2

13. If $f(x) = \sqrt[3]{x} - \frac{1}{\sqrt{x}}$, differentiate $f(x)$.

$$\text{Ans: } f'(x) = \frac{1}{3x^{2/3}} + \frac{1}{2x^{3/2}}$$

Difficulty: moderate Section: 2.2

14. Differentiate: $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$

A) 0 B) x C) $\frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{x^3}}$ D) $\frac{1}{2\sqrt{x}} - \frac{1}{2\sqrt{x^3}}$

Ans: D Difficulty: easy Section: 2.2

15. Differentiate: $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$

A) $\frac{1}{\sqrt{x}} - \frac{1}{\sqrt{x}}$ B) 0 C) 1 D) $\frac{1}{\sqrt{x}} + \frac{1}{\sqrt{x}}$

Chapter 2

$$2x - 2x^3$$

$$2x - 2x^3$$

Ans: A Difficulty: easy Section: 2.2

16. Differentiate: $f(x) = \sqrt[6]{x} - \frac{7}{\sqrt{x}}$

Ans: $\frac{1}{6}x^{-5/6} + \frac{7}{2}x^{-3/2}$

Difficulty: moderate Section: 2.2

17. Differentiate: $f(x) = \frac{2}{3}x^6 - \frac{5x}{6} + \frac{2}{3x} - \sqrt[5]{x}$

Ans: $f'(x) = 4x^5 - \frac{5}{6} - \frac{2}{3x^2} - \frac{1}{5x^{4/5}}$

Difficulty: easy Section: 2.2

18. Differentiate: $f(x) = \frac{2}{5}x^{10} - \frac{5}{8}x + \frac{5}{7x} - \sqrt[9]{x}$

Ans: $4x^9 - \frac{5}{8} - \frac{5}{7x^2} - \frac{1}{9x^{8/9}}$

Difficulty: easy Section: 2.2

19. Find the equation of the tangent line to the curve $f(x) = x^3 - x^2 + 6$ at the point (1, 6).

Ans: $y = x + 5$.

Difficulty: moderate Section: 2.2

20. Find the equation of the tangent line to the curve $f(x) = x^3 - x^2 + 1$ at the point (1, 1).

Ans: $y = x$

Difficulty: moderate Section: 2.2

21. Find the equation of the tangent to the graph of $f(x) = x^2 - 9x + 16$ at the point (1, 8).

Ans: $y = -7x + 15$

Difficulty: moderate Section: 2.2

22. Find the equation of the tangent to the graph of $f(x) = x^2 + 2x + 9$ at the point (1, 12).

Ans: $y = 4x + 8$

Difficulty: moderate Section: 2.2

23. Find the equation of the tangent line to the graph of $f(x) = x^2 + 1$ at (1, 2).

A) Not defined B) $y = 2$ C) $x = 1$ D) $y = 2x$

Ans: D Difficulty: moderate Section: 2.2

24. Find the equation of the tangent line to the graph of $f(x) = x^2 + 5$ at the point (4, 21).

A) $y = 8x - 11$ B) Not defined C) $y = 21$ D) $x = 4$

Ans: A Difficulty: moderate Section: 2.2

25. Find the equation of the line that is tangent to the curve $f(x) = 5 + 3x^2 - x^5$ at the point $(1, 7)$.

Ans: $y = x + 6$

Difficulty: moderate Section: 2.2

26. Find the equation of the line that is tangent to the curve $f(x) = 8 + 7x^2 - x^5$ at the point $(1, 14)$.

Ans: $y = 9x + 5$

Difficulty: moderate Section: 2.2

27. True or False: The equation of the line tangent to the graph of $f(x) = \sqrt{x} + 3$ that passes through $(1, 4)$ is $y = 2x + 3$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.2

28. True or False: The equation of the line tangent to the graph of $f(x) = \sqrt{x} + 6$ that passes through $(9, 9)$ is $y = 2x + 6$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.2

29. Find the equation of the tangent line to the graph of $f(x) = \frac{1}{x}$ at $\left(2, \frac{1}{2}\right)$.

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

Ans: A Difficulty: moderate Section: 2.2

30. Find the equation of the tangent line to the graph of $f(x) = \frac{1}{x}$ at the point $\left(4, \frac{1}{4}\right)$.

A) $y = -\frac{1}{16}x + \frac{1}{2}$ B) $y = -\frac{1}{4}x + \frac{1}{2}$ C) $y = \frac{1}{16}x$ D) $y = \frac{1}{4}x + \frac{1}{2}$

Ans: A Difficulty: moderate Section: 2.2

31. Find the equation of the tangent line to the curve $f(x) = \frac{9}{x} - x$ at the point where $x = 1$.

Ans: $y = -10x + 18$.

Difficulty: moderate Section: 2.2

32. Find the equation of the tangent line to the curve $f(x) = \frac{4}{x} - x$ at the point where $x = 1$.

Ans: $y = -5x + 8$

Difficulty: moderate Section: 2.2

33. Find the rate of change of the given function $f(x)$ with respect for x for the prescribed value $x = -2$.

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

A) -3 B) 15 C) 18 D) 0

Ans: B Difficulty: moderate Section: 2.2

34. Find the relative rate of change of $f(x)$ with respect to x for the prescribed value $x = 1$.

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

A) 19 B) $\frac{1}{19}$ C) $\frac{9}{19}$ D) $\frac{19}{9}$

Ans: D Difficulty: moderate Section: 2.2

35. The gross national product (GNP) of a certain country is $N(t) = t^2 + 3t + 121$ billion

dollars where t is the number of years after 1990. At what percentage rate will the GNP be changing with respect to time in 1995? Round your answer to one hundredth of a percent, if necessary.

Ans: 8.07%

Difficulty: hard Section: 2.2

36. True or False: An environmental study of a certain suburban community suggests that t years from now the average level of carbon monoxide in the air will be

$Q(t) = 0.07t^2 + 0.2t + 2.8$ ppm. The rate that the carbon monoxide level will change with

respect to time 2 years from now will be 0.048 ppm/yr.

A) True B) False

Ans: B Difficulty: hard Section: 2.2

37. True or False: The gross annual earnings of a certain company were

$E(t) = 0.2t^2 + 9t + 30$ thousand dollars where t is the number of years since its formation in 1990. The gross annual earnings with respect to t in 1995 are growing at 13.75%.

A) True B) False

Ans: A Difficulty: hard Section: 2.2

38. True or False: An environmental study of a certain suburban community suggests that t years from now the average level of carbon monoxide in the air will be

$Q(t) = 0.07t^2 + 0.2t + 3.2$ parts per million (ppm). The rate that the carbon monoxide level will change with respect to time 3 years from now will be 0.42 ppm/yr.

A) True B) False

Ans: B Difficulty: hard Section: 2.2

39. An appliance store manager estimates that for x television ads run per day, $R(x) = -0.01x^3 + x^2 - 3x + 200$ refrigerators will be sold per month. Find $R'(4)$ and interpret what it tells us about sales.
- A) $R'(4) = 203.36$; they'll sell about 203 refrigerators if they run 4 ads per day.
 B) $R'(4) = 4.52$; they'll sell about 5 refrigerators if they run 4 ads per day.
 C) $R'(4) = 4.52$; sales will be increasing at about 5 refrigerators per month per ad when they're running 4 ads.
 D) $R'(4) = 203.36$; the cost of refrigerators will be rising by \$203.36 if they're selling 4 per day.
- Ans: C Difficulty: easy Section: 2.2
40. An efficiency study at a certain factory indicates that an average worker who arrives on the job at 8:00 A.M. will have produced $Q(t) = -t^3 + 6t^2 + 18t$ units t hours later. At what rate, in units/hour, is the worker's rate of production changing with respect to time at 9:00 A.M.?
- Ans: 27 units/hour
 Difficulty: hard Section: 2.2
41. The displacement function of a moving object is described by $s(t) = t^2 + 5t - 2$. What is the object's acceleration?
- A) $2t + 5$ B) $2t$ C) t D) 2
- Ans: D Difficulty: hard Section: 2.2
42. The displacement function of a moving object is described by $s(t) = t^2 + 5t - 4$. What is the acceleration of the object as a function of time?
- A) 2 B) $2t + 5$ C) $2t$ D) t
- Ans: A Difficulty: moderate Section: 2.2
43. If the position of an object moving along a straight line is given by $s(t) = t^3 - 9t^2 + 3t$ at time t , find the object's velocity as a function of time.
- A) $v(t) = 3t^2 - 9t + 3$ C) $v(t) = t^2 - 9t + 3$
 B) $v(t) = t^2 - 18t$ D) $v(t) = 3t^2 - 18t + 3$
- Ans: D Difficulty: moderate Section: 2.2
44. The displacement function of a moving object is described by $s(t) = t^3 + 2t - 1$. What is the velocity of the object as a function of t ?
- A) $3t^2$ B) $3t^2 + 2$ C) 3 D) 2
- Ans: B Difficulty: easy Section: 2.2

45. An object moves along a line in such a way that its position at time t is $s(t) = t^3 - 27t^2 + 231t + 3$. Find the velocity and acceleration of the object at time t . When is the object stationary?

A) $v(t) = 3t^2 - 54t + 231$; $a(t) = 6t - 54$; $t = 7$ and 11

B) $v(t) = 3t^2 - 54t + 231$; $a(t) = 6t - 54$; $t = 9$

C) $v(t) = 3t^2 - 18t + 231$; $a(t) = 6t - 18$; $t = 7$

D) $v(t) = 3t^2 - 54t + 231$; $a(t) = 6t - 54$; $t = 7$

Ans: A Difficulty: moderate Section: 2.2

46. The displacement function of a moving object is described by $s(t) = t^3 + 5t - 3$. What is the velocity of the object as a function of time?

A) $3t^2 + 5$ B) $3t^2$ C) 3 D) 2

Ans: A Difficulty: easy Section: 2.2

47. True or False: If the displacement of a moving object is $s(t) = t^3$, the acceleration is $6t$.

A) True B) False

Ans: A Difficulty: easy Section: 2.2

48. True or False: If the displacement of a moving object is $s(t) = 5t^3$, the acceleration is $30t$.

A) True B) False

Ans: A Difficulty: easy Section: 2.2

49. If an object moves in such a way that after t seconds, the distance from its starting point is $D(t) = t^3 - 15t^2 + 80t$ meters, find the acceleration after 2 seconds in meters/s².

Ans: -18 meters/s²

Difficulty: hard Section: 2.2

50. Differentiate: $f(x) = (x^2 + 1)(x + 3)$

A) $2x + 1$ B) $6x + 1$ C) $3x^2 + 6x + 1$ D) $x^2 + 1$

Ans: C Difficulty: moderate Section: 2.3

51. Differentiate: $f(x) = (x^2 + 5)(x + 4)$

A) $3x^2 + 8x + 5$ B) $2x + 1$ C) $40x + 1$ D) $x^2 + 1$

Ans: A Difficulty: moderate Section: 2.3

52. What is the rate of change of $f(t) = \frac{3t-3}{t+4}$ with respect to t when $t = 4$?

A) $\frac{15}{64}$ B) $\frac{15}{8}$ C) 8 D) $\frac{7}{8}$

Ans: A Difficulty: hard Section: 2.3

53. If $f(x) = \frac{7x-5}{8x+3}$, what is $f'(x)$?

Ans: $f'(x) = \frac{-61}{(8x+3)^2}$

Difficulty: moderate Section: 2.3

54. If $f(x) = \frac{3x-1}{x+1}$, what is $f'(x)$?

Ans: $\frac{4}{(x+1)^2}$

Difficulty: moderate Section: 2.3

55. Differentiate: $f(x) = \frac{x^2}{x-2}$

A) $\frac{x^2-4x}{(x-2)^2}$ B) $\frac{x^2+4x}{(x-2)^2}$ C) $2x$ D) $-x$

Ans: A Difficulty: moderate Section: 2.3

56. Differentiate: $f(x) = \frac{x^2}{x-7}$

A) $\frac{x^2-14x}{(x-7)^2}$ B) $\frac{3x^2+14x}{(x-7)^2}$ C) $2x$ D) $-x$

Ans: A Difficulty: moderate Section: 2.3

57. If $f(x) = \frac{6-3x^2}{x^3+3x-5}$, what is $f'(x)$?

Ans: $f'(x) = \frac{3x^4-27x^2+30x-18}{(x^3+3x-5)^2}$

Difficulty: hard Section: 2.3

58. If $f(x) = \frac{2-3x^2}{x^3+x-1}$, what is $f'(x)$?

Ans: $\frac{3x^4-9x^2+6x-2}{(x^3+x-1)^2}$

Difficulty: hard Section: 2.3

59. True or False: The equation of the line that is tangent to the curve $f(x) = (3x^5 - 7x^2 + 5)(x^3 + x - 1)$ at the point $(0, -5)$ is $y = 5x - 5$.
A) True B) False

Ans: A Difficulty: hard Section: 2.3

60. True or False: The equation of the tangent line to the curve $f(x) = (2x^5 - 3x^2 + 6)(x^3 + x - 1)$ at the point $(0, -6)$ is $y = 6x - 6$.
A) True B) False

Ans: A Difficulty: hard Section: 2.3

61. Find the equation of the line that is tangent to the curve $f(x) = \frac{5x^2 - 7x + 1}{5 - 4x^3}$ at the point $(1, -1)$.

Ans: $y = -9x + 8$

Difficulty: hard Section: 2.3

62. Find the equation of the tangent line to the curve $f(x) = \frac{6x^2 - 4x + 8}{3 - 2x^3}$ at the point $(1, 10)$.

Ans: $y = 68x - 58$

Difficulty: hard Section: 2.3

63. What is the rate of change of $f(t) = \frac{2t-3}{t+5}$ with respect to t when $t = 5$?

A) $\frac{13}{100}$ B) $\frac{17}{10}$ C) 10 D) $\frac{7}{10}$

Ans: A Difficulty: hard Section: 2.3

64. What is the rate of change of $f(t) = \frac{6t-3}{t+9}$ with respect to t when $t = 48$?

A) $\frac{1}{57}$ B) $-\frac{1}{57}$ C) 57 D) -57

Ans: A Difficulty: hard Section: 2.3

65. Find the equation of the normal line to $f(x) = 2x^3 - 8x + 15$ at the point with x -coordinate -2 .

Ans: $y = -\frac{1}{x} + \frac{119}{8}$

Difficulty: moderate Section: 2.3

66. Find an equation for the tangent line to the curve $y = \sqrt{2 + \frac{1}{5}x}$ at the point where $x = -1$.

Ans: $y = \frac{\sqrt{5}}{30}x + \frac{19\sqrt{5}}{30}$

Difficulty: hard Section: 2.3

67. Find $f''(x)$, where $f(x) = \frac{3}{1+x^3}$.

Ans: $\frac{-18x(1-2x^3)}{(1+x^3)^3}$

Difficulty: hard Section: 2.3

68. Find $f''(x)$, where $f(x) = x^3 + 4$.

Ans: $6x$

Difficulty: easy Section: 2.3

69. The temperature in degrees Fahrenheit inside an oven t minutes after turning it on can be modeled with the function

$F(t) = \frac{400t+70}{t+1}$. Find $F'(5)$ and interpret what it tells us about the temperature.

Round your answer to 2 decimal places.

Ans: $F'(5) = 9.17$; After 5 minutes, the temperature is increasing at the rate of 9.17 degrees per minute.

Difficulty: easy Section: 2.3

70. It is estimated that t years from now, the population of a certain suburban community will be $p(t) = 30 - \frac{4}{7t+3}$ thousand people. At what rate will the population be growing 3

years from now?

Ans: 49 people/year

Difficulty: hard Section: 2.3

71. Find $f^{(4)}(x)$ if $f(x) = x^5 - 7x^4 + 10x^3 - 6x^2 + 10x - 11$.

A) $f^{(4)}(x) = 60x^2 - 168x + 60$

C) $f^{(4)}(x) = x^2 - 7x$

B) $f^{(4)}(x) = 120x - 168$

D) $f^{(4)}(x) = x^2 - 7x + 10$

Ans: B Difficulty: moderate Section: 2.3

72. True or False: If $f(x) = 3x^5 - 7x^3 + 2x^2 + 5$, then $f'''(x) = 180x^2 - 42$.

A) True B) False

Ans: A Difficulty: moderate Section: 2.3

73. Find $f'''(x)$ if $f(x) = \frac{1}{\sqrt{2x}} - \frac{1}{x^2} + \sqrt{x}$.

A) $f'''(x) = -\frac{3}{8x^3\sqrt{2x}} + \frac{1}{x^3}$

C) $f'''(x) = -\frac{15}{8x^3\sqrt{2x}} + \frac{24}{x^5}$

B) $f'''(x) = -\frac{15}{16x^3\sqrt{2x}} + \frac{24}{x^5}$

D) $f'''(x) = -\frac{15}{64x^3\sqrt{2x}} + \frac{24}{x^5}$

Ans: C Difficulty: moderate Section: 2.3

74. Find $\frac{dy}{dx}$ if $y = \sqrt[3]{u}$ and $u = x^4 - 3x^3 - 7$.

Ans: $\frac{4x^3 - 9x^2}{3\sqrt[3]{(x^4 - 3x^3 - 7)^2}}$

Difficulty: hard Section: 2.4

75. Find $\frac{dy}{dx}$ if $y = u^3 + 2u^2 - 3$ and $u = x^2 + x - 1$.

Ans: $6x^5 + 15x^4 + 8x^3 - 3x^2 - 4x - 1$

Difficulty: hard Section: 2.4

76. Find $\frac{dy}{dx}$ if $y = u^3 + 7u^2 - 3$ and $u = x^2 + x - 6$.

Ans: $3(2x+1)(x^2+x-6)^2 + 28x^3 + 42x^2 - 154x - 84$

Difficulty: hard Section: 2.4

77. Find $\frac{dy}{dx}$ if $y = \sqrt[3]{u}$ and $u = x^4 - 2x^3 - 6$.

Ans: $\frac{4x^3 - 6x^2}{3(x^4 - 2x^3 - 6)^{2/3}}$

Difficulty: hard Section: 2.4

78. Find $\frac{dy}{dx}$ if $y = \frac{1}{3u-1}$ and $u = \frac{1}{x+2}$.

Ans: $\frac{3}{(1-x)^2}$

Difficulty: hard Section: 2.4

79. Find $\frac{dy}{dx}$ if $y = \frac{1}{7u-1}$ and $u = \frac{1}{x+3}$.

Ans: $\frac{7}{(4-x)^2}$

Difficulty: hard Section: 2.4

80. True or False: If $f(x) = \frac{(3-5x)^3}{(x^2+x-1)^2}$, then $f'(x) = -5(2x+1)$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.4

81. True or False: If $f(x) = \frac{x^2-3x+5}{\sqrt{1-3x}}$, then $f'(x) = \frac{2x-3}{\sqrt{1-3x}}$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.4

82. True or False: An equation for the tangent line to the curve $f(x) = \sqrt{3x^2+5x}$ at the point where $x = 1$ is $y = 2x - 1$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.4

83. An equation for the tangent line to the curve $y = (x^2+x-1)^3$ at the point where $x = 1$ is:

A) $y = 9x - 8$ B) $y = 9x$ C) $y = 2x + 1$ D) $y = 9x - 1$

Ans: A Difficulty: moderate Section: 2.4

84. Find an equation for the tangent line to the curve $y = (7x^2+x-1)^3$ at the point where $x = 0$.

A) $y = 14x + 1$ B) $y = 24x + 3$ C) $y = 3x + 1$ D) $y = 3x - 1$

Ans: D Difficulty: moderate Section: 2.4

85. An equation for the tangent line to the curve $y = (x^4+x-1)^8$ at the point where $x = 1$ is

A) $y = 40x - 39$ B) $y = 40x$ C) $y = 4x + 1$ D) $y = 40x - 1$

Ans: A Difficulty: moderate Section: 2.4

86. An equation for the tangent line to the curve $y = (4x^2+x-1)^3$ at the point where $x = 0$ is

A) $y = 3x - 1$ B) $y = 6x + 1$ C) $y = 3x + 1$ D) $y = 6x - 1$

Ans: A Difficulty: moderate Section: 2.4

87. True or False: An equation for the tangent line to the curve $f(x) = x^3(1-3x)^2$ at the point where $x = -1$ is $y = 72x + 56$.

A) True B) False

Ans: A Difficulty: moderate Section: 2.4

88. Find an equation for the tangent line to the curve $y = \sqrt{4 + \frac{x}{4}}$ at the point where $x = -1$.

Round numbers to two decimal places.

Ans: $y = 0.06x + 2.00$

Difficulty: hard Section: 2.4

89. Find all points on the graph of the function $f(x) = x^3(6x + 24)$ where the tangent line is horizontal.

Ans: $(0, 0)$ and $(-3, -162)$

Difficulty: moderate Section: 2.4

90. Find all points on the graph of the function $f(x) = \frac{x^2}{x+2}$ where the tangent line is horizontal.

A) There are none. B) $(2, 1)$ C) $(0, 0)$ and $(-4, -8)$ D) $(0, 0)$

Ans: C Difficulty: moderate Section: 2.4

91. True or False: If $f(x) = x\sqrt{2-x}$, then $f''(x) = 0$ at $x = 0$ and $x = 2$.

A) True B) False

Ans: B Difficulty: hard Section: 2.4

92. True or False: If $f(x) = \sqrt{1-3x^2}$, then $f''(x) = \frac{-3}{(1-3x^2)^{3/2}}$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.4

93. If $g(y) = \sqrt{20y + y^2}$ represents the height in inches of a sapling y weeks after

germination, find $g'(3)$ and interpret what it tells us about the height of the tree. Round

your answer to 1 decimal place.

Ans: after 3 weeks, the tree is growing at 1.6 inches per week.

Difficulty: easy Section: 2.4

94. At a certain factory, the total cost of manufacturing q units during the daily production run is $C(q) = 0.3q^2 + 0.8q + 800$ dollars. It has been determined that approximately $q(t) = t^2 + 80t$ units are manufactured during the first t hours of a production run.

Compute the rate at which the total manufacturing cost is changing with respect to time 2 hours after production begins.

Ans: It is increasing at \$8,332.80/hour

Difficulty: hard Section: 2.4

95. When toasters are sold for p dollars apiece, local consumers will buy $D(p) = \frac{57,600}{p}$

toasters a month. It is estimated that t months from now, the price of the toasters will be $p(t) = 0.03t^{3/2} + 22.08$ dollars. Compute the rate at which the monthly demand for the toasters will be changing with respect to time 16 months from now.

Ans: Decreasing by 18 toasters/month

Difficulty: hard Section: 2.4

96. True or False: When a certain commodity is sold for p dollars per unit, consumers will buy $D(p) = \frac{30,000}{p}$ units per month. It is estimated that t months from now, the price of

the commodity will be $p(t) = 0.3t^{5/2} + 5.4$ dollars per unit. The monthly demand will be decreasing 40 months from now.

A) True B) False

Ans: A Difficulty: hard Section: 2.4

97. When a certain commodity is sold for p dollars per unit, consumers will buy $D(p) = \frac{31,500}{p}$ units per month. It is estimated that t months from now, the price of the

commodity will be $p(t) = t^{2/3} + 5.15$ dollars per unit. The approximate rate at which the

monthly demand will be changing with respect to time in 27 months is

- A) -35 units per month C) -32 units per month
B) 35 units per month D) -132 units per month

Ans: A Difficulty: hard Section: 2.4

98. It is estimated that t years from now, the population of a certain suburban community will be $p(t) = 50 - \frac{7}{2t+1}$ thousand people. At what rate, in people/year will the population be

growing 3 years from now?

Ans: 286 people/year

Difficulty: hard Section: 2.4

99. True or False: It is estimated that t years from now, the population of a certain suburban community will be $p(t) = 30 - \frac{7}{2t+1}$ thousand. An environmental study indicates that the

average daily level of carbon monoxide in the air will be $C(p) = 0.3\sqrt{p^2 + p + 30}$ parts

per million (ppm) when the population is p thousand. The rate at which the level of pollution is changing with respect to time 3 years from now is about 0.084 ppm per year.

A) True B) False

Ans: A Difficulty: hard Section: 2.4

100. It is estimated that t years from now, the population of a certain community will be

$p(t) = 14 - \frac{6}{3+t}$ thousand. An environmental study indicates that the average daily level

of carbon monoxide in the air will be $C(p) = 0.5\sqrt{p^2 + 2p + 30}$ units when the

population is p thousand. The rate at which the level of carbon monoxide will be changing 3 years from now is

A) -0.078 ppm per thousand people C) 1.000 ppm per thousand people
B) 0.078 ppm per thousand people D) -1.000 ppm per thousand people

Ans: B Difficulty: hard Section: 2.4

101. True or False: The function $f(x) = \frac{x}{2x+1} - 5$ will decrease by approximately 0.6 as x decreases from 3 to 2.7.

A) True B) False

Ans: B Difficulty: hard Section: 2.5

102. The largest percentage error you can allow in the measurement of the radius of a sphere if you want the error in the calculation of its surface area using the formula $S = 4\pi r^2$ to be no greater than 6 percent is about:

A) 6% B) 3% C) 1% D) 2%

Ans: B Difficulty: hard Section: 2.5

103. You measure the side of a cube to be 12 centimeters long and conclude that the volume of the cube is $12^3 = 1,728$ cubic centimeters. If your measurement of the side is accurate to within 4%, approximately how accurate is your calculation of this volume? Round to two decimal places, if necessary.

A) Maximum error in volume is about $\pm 17.28 \text{ cm}^3$
B) Maximum error in volume is about $\pm 207.36 \text{ cm}^3$
C) Maximum error in volume is about $\pm 1.44 \text{ cm}^3$
D) Maximum error in volume is about $\pm 2,488.32 \text{ cm}^3$

Ans: B Difficulty: moderate Section: 2.5

104. If the total cost of manufacturing q units of a certain commodity is $C(q) = (3q + 1)(5q + 7)$, use marginal analysis to estimate the cost of producing the 19th unit, in dollars.

Ans: 596 dollars

Difficulty: hard Section: 2.5

105. An efficiency study of the morning shift at a certain factory indicates that an average worker arriving on the job at 7:00 A.M. will have assembled $f(x) = -x^3 + 7x^2 - 2x$

transistor radios x hours later. Approximately how many radios will the worker assemble between 10:00 and 10:45 A.M.?

- A) Approximately 13 radios C) Approximately 10 radios
B) Approximately 585 radios D) Approximately 30 radios

Ans: C Difficulty: moderate Section: 2.5

106. True or False: If $x^3 + y^3 = x + y$, then $\frac{dy}{dx} = \frac{3x^2 - 1}{3y^2 - 1}$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.6

107. Find $\frac{dy}{dx}$, where $xy^3 - 3x^2 = 7y$.

- A) $y^3 - 6x - 7$ B) $\frac{6x - y^3}{3xy^2 - 7}$ C) $y^3 - 6x$ D) $\frac{6x^2}{y^3}$

Ans: B Difficulty: moderate Section: 2.6

108. Find $\frac{dy}{dx}$, where $\sqrt{x} + \sqrt{y} = xy$.

Ans: $\frac{\sqrt{y}(2 - xy - 1)}{\sqrt{x}(1 - 2x\sqrt{y})}$

Difficulty: moderate Section: 2.6

109. Find $\frac{dy}{dx}$, where $\frac{3}{x} + \frac{1}{2y} = 5$.

Ans: $-\frac{6y^2}{x^2}$

Difficulty: moderate Section: 2.6

110. True or False: If $x^2 + 3xy + y^2 = 15$, then $\frac{dy}{dx} = 2x + 3y$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.6

111. True or False: If $x^2y + xy^2 = 7$, then $\frac{dy}{dx} = 2xy + y^2$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.6

112. True or False: If $x^2 + 2y^2 = 5$, then $\frac{dy}{dx} = 2x$.

A) True B) False

Ans: B Difficulty: moderate Section: 2.6

113. Find an equation for the tangent line to the curve $x^3 + xy + y^3 = x$ at the point $(1, 0)$.

Ans: $y = -2x + 2$

Difficulty: hard Section: 2.6

114. Find the slope of the tangent line to the curve $x^2 + 3xy - y^2 = 3$ at the point $(1, 1)$.

A) 5 B) 1 C) -5 D) 3

Ans: C Difficulty: hard Section: 2.6

115. Find an equation for the tangent line to the curve $x^2 + y^3 = xy + 1$ at the point $(1, -1)$.

Ans: $y = -\frac{3}{2}x + \frac{1}{2}$

Difficulty: hard Section: 2.6

116. Find the equation of the tangent line to the given curve at the specified point:

$x^4y^3 - 4xy = 8x + y - 13$; $(0, 13)$

A) $y = \frac{1}{60}x + 13$ B) $y = -\frac{1}{60}x + 13$ C) $y = -60x + 13$ D) $y = 60x + 13$

Ans: C Difficulty: moderate Section: 2.6

117. True or False: The equation for the tangent line to the curve $x^2 + 2xy = y^3$ at the point $(1, -1)$ is $y = -1$.

A) True B) False

Ans: A Difficulty: hard Section: 2.6

118. Use implicit differentiation to find $\frac{d^2y}{dx^2}$ for $4x^5 + 11y = 100$.

A) $80x^3$ B) $-\frac{80}{11}x^3$ C) $60x^2 + 11$ D) $60x^2 - 100$

Ans: B Difficulty: easy Section: 2.6

