

Use Scantron 882E to transfer the answers.

**Provide an appropriate response.**

1) What information does the difference quotient,  $\frac{f(x+h) - f(x)}{h}$ , provide about the differentiable function  $f(x)$ ? 1) \_\_\_\_\_

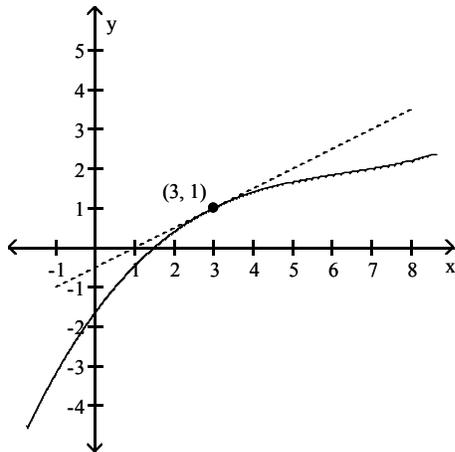
- A) The average rate of change of  $f(x)$  over the interval  $[x, x+h]$ .
- B) The limit of  $f(x)$  as  $x$  approaches  $h$ .
- C) The slope of the line tangent to  $f(x)$  at the point  $(x, f(x))$ .
- D) The instantaneous rate of change of  $f(x)$  as a function of  $x$ .

2) What is the derivative of a function  $f(x)$ ? 2) \_\_\_\_\_

- A) The derivative of the function  $f(x)$  is a function, usually denoted  $f'(x)$ , whose output  $f'(a)$  is the instantaneous value of  $f(x)$  at the point  $(a, f(a))$ , where  $a$  is any value of  $x$  in the domain for  $f(x)$  where  $f'(x)$  exists.
- B) The derivative of the function  $f(x)$  is a function, usually denoted  $f'(x)$ , whose output  $f'(a)$  is the average value of  $f(x)$  at the point  $(a, f(a))$ , where  $a$  is any value of  $x$  in the domain for  $f(x)$  where  $f'(x)$  exists.
- C) The derivative of the function  $f(x)$  is a function, usually denoted  $f'(x)$ , whose output  $f'(a)$  is the instantaneous rate of change of  $f(x)$  at the point  $(a, f(a))$ , where  $a$  is any value of  $x$  in the domain for  $f(x)$  where  $f'(x)$  exists.
- D) The derivative of the function  $f(x)$  is a function, usually denoted  $f'(x)$ , whose output  $f'(a)$  is the average rate of change of  $f(x)$  at the point  $(a, f(a))$ , where  $a$  is any value of  $x$  in the domain for  $f(x)$  where  $f'(x)$  exists.

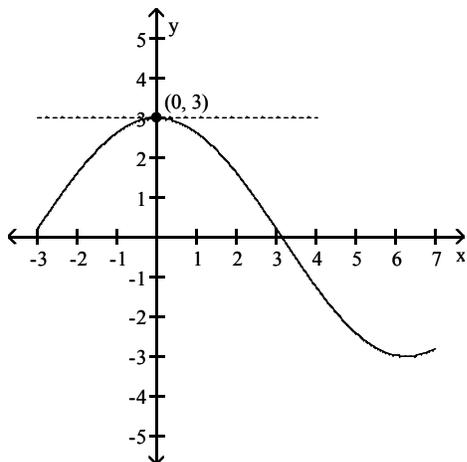
**Estimate the slope of the tangent line to the curve at the given point.**

3) 3) \_\_\_\_\_



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

4)



A) undefined

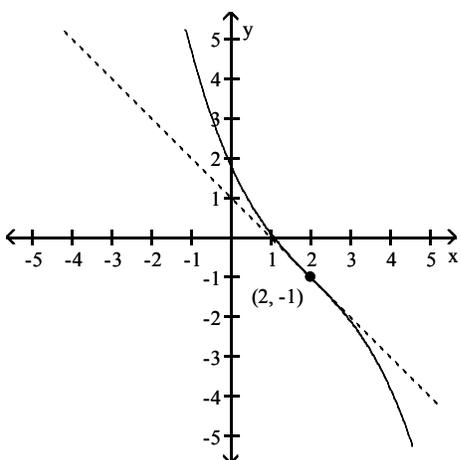
B) 3

C) 1

D) 0

4) \_\_\_\_\_

5)



A) 1

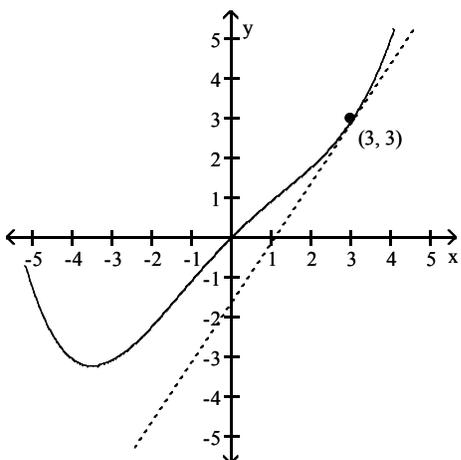
B)  $-\frac{3}{2}$

C) -1

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

5) \_\_\_\_\_

6)



A) 3

B)  $\frac{1}{2}$

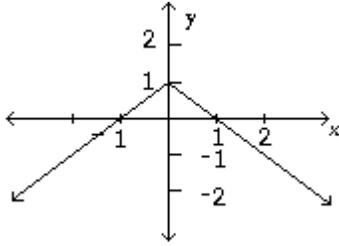
C)  $\frac{2}{3}$

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

6) \_\_\_\_\_

Find the  $x$ -values where the function does not have a derivative.

7)



A)  $x=2$

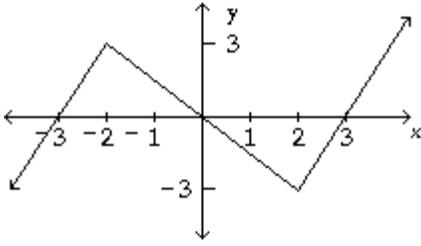
B)  $x=0$

C)  $x=-1$

D)  $x=1$

7) \_\_\_\_\_

8)



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

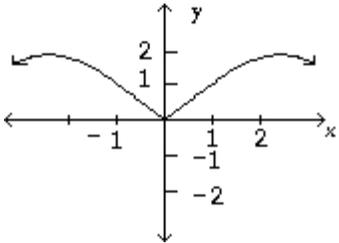
C)  $x=-2, x=0, x=2$

B)  $x=-3, x=0, x=3$

D)  $x=-3, x=3$

8) \_\_\_\_\_

9)



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

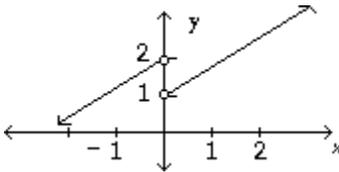
C)  $x=2$

B)  $x=-2, x=0, x=2$

D)  $x=0$

9) \_\_\_\_\_

10)



A)  $x=0$

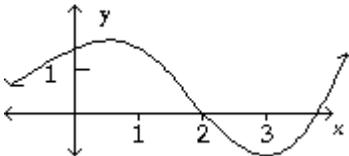
C)  $x=0, x=1, x=2$

B)  $x=1$

D)  $x=2$

10) \_\_\_\_\_

11)



A)  $x=1, x=3$

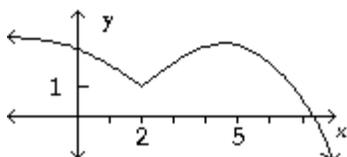
C)  $x=2$

B)  $x=1, x=2, x=3$

D) Exists at all points

11) \_\_\_\_\_

12)

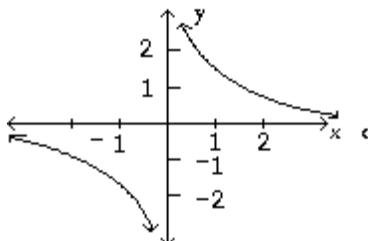


- A)  $x = 5$   
 C)  $x = 2, x = 5$

- B)  $x = 2$   
 D) Exists at all points

12) \_\_\_\_\_

13)



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

- B)  $x = -1, x = 0, x = 1$   
 D) Exists at all points

13) \_\_\_\_\_

**Find the derivative.**

14)  $y = x^7$

A)  $\frac{dy}{dx} = x^6$

B)  $\frac{dy}{dx} = x^7$

C)  $\frac{dy}{dx} = 7x^7$

D)  $\frac{dy}{dx} = 7x^6$

14) \_\_\_\_\_

15)  $y = 8 - 4x^2$

A)  $\frac{dy}{dx} = 8 - 4x$

B)  $\frac{dy}{dx} = 8 - 8x$

C)  $\frac{dy}{dx} = -8$

D)  $\frac{dy}{dx} = -8x$

15) \_\_\_\_\_

16)  $y = 0.25x^{6.6}$

A)  $\frac{dy}{dx} = 1.65x^{6.6}$

B)  $\frac{dy}{dx} = 0.25x^{5.6}$

C)  $\frac{dy}{dx} = 1.9x^{7.6}$

D)  $\frac{dy}{dx} = 1.65x^{5.6}$

16) \_\_\_\_\_

17)  $y = 4 - 3x^3$

A)  $\frac{dy}{dx} = -6x^2$

B)  $\frac{dy}{dx} = -9x^2$

C)  $\frac{dy}{dx} = -9x$

D)  $\frac{dy}{dx} = 4 - 9x^2$

17) \_\_\_\_\_

18)  $y = 5x^2 - 2.1x$

A)  $\frac{dy}{dx} = 5x - 2.1$

B)  $\frac{dy}{dx} = 5x^2 - 2.1$

C)  $\frac{dy}{dx} = 10x - 2.1$

D)  $\frac{dy}{dx} = 10x^2 - 2.1$

18) \_\_\_\_\_

19)  $y = \frac{1}{2}x^6 - \frac{1}{5}x^5$

A)  $\frac{dy}{dx} = \frac{1}{2}x^5 - \frac{1}{5}x^4$

B)  $\frac{dy}{dx} = 3x^7 - x^6$

C)  $\frac{dy}{dx} = 3x^6 - x^5$

D)  $\frac{dy}{dx} = 3x^5 - x^4$

19) \_\_\_\_\_

- 20)  $f(x) = 6x^{210}$  20) \_\_\_\_\_  
 A)  $f'(x) = 1260x^{209}$  B)  $f'(x) = 1260x^{210}$  C)  $f'(x) = 1260x^{211}$  D)  $f'(x) = 6x^{209}$
- 21)  $f(x) = 6x + 8$  21) \_\_\_\_\_  
 A)  $f'(x) = 6x$  B)  $f'(x) = 6$  C)  $f'(x) = 0$  D)  $f'(x) = 14$
- 22)  $f(x) = 4x^2 + 2x + 9$  22) \_\_\_\_\_  
 A)  $f'(x) = 8x + 2$  B)  $f'(x) = 4x^2 + 2$  C)  $f'(x) = 8x^2 + 2$  D)  $f'(x) = 4x + 2$
- 23)  $f(x) = 3x^4 - 9x^3 + 5$  23) \_\_\_\_\_  
 A)  $f'(x) = 4x^3 + 3x^2 - 7$  B)  $f'(x) = 12x^3 - 27x^2$   
 C)  $f'(x) = 12x^3 - 27x^2 - 7$  D)  $f'(x) = 4x^3 + 3x^2$

**Find the derivative of the function and evaluate the derivative at the given x -value.**

- 24)  $f(x) = 3x^2$  at  $x = 1$  24) \_\_\_\_\_  
 A)  $f'(x) = 6x; f'(1) = 3$  B)  $f'(x) = 3x; f'(1) = 3$   
 C)  $f'(x) = 6x^2; f'(1) = 6$  D)  $f'(x) = 6x; f'(1) = 6$
- 25)  $f(x) = 5x + 9$  at  $x = 2$  25) \_\_\_\_\_  
 A)  $f'(x) = 9; f'(2) = 9$  B)  $f'(x) = 5; f'(2) = 5$   
 C)  $f'(x) = 5x; f'(2) = 10$  D)  $f'(x) = 0; f'(2) = 0$
- 26)  $f(x) = x^2 + 5x$  at  $x = 4$  26) \_\_\_\_\_  
 A)  $f'(x) = 4x + 5; f'(4) = 21$  B)  $f'(x) = 2x - 5; f'(4) = 3$   
 C)  $f'(x) = x + 5; f'(4) = 9$  D)  $f'(x) = 2x + 5; f'(4) = 13$
- 27)  $f(x) = \frac{1}{5}x - \frac{1}{2}$  at  $x = 10$  27) \_\_\_\_\_  
 A)  $f'(x) = -\frac{1}{5}; f'(10) = -\frac{1}{5}$  B)  $f'(x) = \frac{1}{2}; f'(10) = \frac{1}{2}$   
 C)  $f'(x) = \frac{1}{5}; f'(10) = \frac{1}{5}$  D)  $f'(x) = -\frac{1}{2}; f'(10) = -\frac{1}{2}$
- 28)  $f(x) = 5x^2 + x$  at  $x = -4$  28) \_\_\_\_\_  
 A)  $f'(x) = x - 10; f'(-4) = -14$  B)  $f'(x) = 10x + 1; f'(-4) = -39$   
 C)  $f'(x) = x + 10; f'(-4) = 6$  D)  $f'(x) = 10x - 1; f'(-4) = -41$
- 29)  $f(x) = 2x^2 + x - 3$  at  $x = 4$  29) \_\_\_\_\_  
 A)  $f'(x) = 4x - 1; f'(4) = 15$  B)  $f'(x) = 2x - 3; f'(4) = 5$   
 C)  $f'(x) = 4x + 3; f'(4) = 19$  D)  $f'(x) = 4x + 1; f'(4) = 17$
- 30)  $f(x) = x^2 + 11x - 15$  at  $x = 1$  30) \_\_\_\_\_  
 A)  $f'(x) = 2x - 11; f'(1) = -9$  B)  $f'(x) = 11x; f'(1) = 11$   
 C)  $f'(x) = 2x + 11; f'(1) = 13$  D)  $f'(x) = 11x + 15; f'(1) = 26$

31)  $f(x) = 3x^2 + 5x - 7$  at  $x = -2$   
 A)  $f'(x) = 6x + 5; f'(-2) = -7$   
 C)  $f'(x) = 3x + 5; f'(-2) = -1$

B)  $f'(x) = 6x - 5; f'(-2) = -17$   
 D)  $f'(x) = 2x + 5; f'(-2) = 1$

31) \_\_\_\_\_

32)  $f(x) = 1 - x^3$  at  $x = 1$   
 A)  $f'(x) = 3x^2 - 1; f'(1) = 2$   
 C)  $f'(x) = 1 - 3x; f'(1) = -2$

B)  $f'(x) = -3x^2; f'(1) = -3$   
 D)  $f'(x) = -3x; f'(1) = -3$

32) \_\_\_\_\_

**Find  $f'(x)$  at the given value of  $x$ .**

33)  $f(x) = x^2 - 9x - 3$ ; Find  $f'(-1)$ .  
 A) -2

B) -14

C) -11

D) 7

33) \_\_\_\_\_

34)  $f(x) = -9x^2 + 6x$ ; Find  $f'(6)$ .  
 A) -72

B) -108

C) -87

D) -102

34) \_\_\_\_\_

**Find the derivative of the function and evaluate the derivative at the given  $x$ -value.**

35)  $f(x) = \frac{8}{x}$  at  $x = -1$

A)  $f'(x) = 8; f'(-1) = 8$

B)  $f'(x) = -8x^2; f'(-1) = -8$

C)  $f'(x) = \frac{8}{x^2}; f'(-1) = 8$

D)  $f'(x) = -\frac{8}{x^2}; f'(-1) = -8$

35) \_\_\_\_\_

**Find  $f'(x)$  at the given value of  $x$ .**

36)  $f(x) = \frac{-11}{x}$ ; Find  $f'(-8)$ .

A)  $\frac{11}{64}$

B)  $\frac{11}{8}$

C)  $\frac{64}{11}$

D)  $\frac{8}{11}$

36) \_\_\_\_\_

37)  $f(x) = \frac{32}{x}$ ; Find  $f'(2)$ .

A) 16

B) -8

C) -16

D) 32

37) \_\_\_\_\_

38)  $f(x) = \sqrt{x}$ ; Find  $f'(81)$ .

A)  $\frac{1}{9}$

B) 9

C)  $\frac{1}{18}$

D) 81

38) \_\_\_\_\_

39)  $f(x) = 7\sqrt{x}$ ; Find  $f'(5)$ .

A)  $\frac{7\sqrt{5}}{2}$

B)  $\frac{7}{2\sqrt{5}}$

C) 70

D) Does not exist

39) \_\_\_\_\_

**Find the derivative.**

40)  $y = -8\sqrt{x}$

A)  $\frac{dy}{dx} = -\frac{8}{\sqrt{x}}$

B)  $\frac{dy}{dx} = -\frac{4}{\sqrt{x}}$

C)  $\frac{dy}{dx} = 4\sqrt{x}$

D)  $\frac{dy}{dx} = \frac{4}{\sqrt{x}}$

40) \_\_\_\_\_

41)  $y = \sqrt[6]{x^5}$  41) \_\_\_\_\_

A)  $\frac{dy}{dx} = \frac{5}{6\sqrt[6]{x}}$  B)  $\frac{dy}{dx} = \frac{5\sqrt[6]{x}}{6}$  C)  $\frac{dy}{dx} = \frac{6\sqrt[5]{x}}{5}$  D)  $\frac{dy}{dx} = \frac{1}{\sqrt[6]{x}}$

42)  $y = \frac{8}{x} - \frac{x}{8}$  42) \_\_\_\_\_

A)  $\frac{dy}{dx} = -\frac{8}{x^2} - \frac{1}{8}$  B)  $\frac{dy}{dx} = \frac{8}{x^2} - \frac{1}{8}$  C)  $\frac{dy}{dx} = -8x - \frac{1}{8}$  D)  $\frac{dy}{dx} = -\frac{8}{x^2} + \frac{x}{8}$

43)  $y = \frac{6}{x^4} - \frac{9}{x}$  43) \_\_\_\_\_

A)  $\frac{dy}{dx} = -\frac{24}{x^5} + \frac{9}{x^2}$  B)  $\frac{dy}{dx} = -\frac{24}{x^3} - 9x$

C)  $\frac{dy}{dx} = -\frac{24}{x^5} - \frac{9}{x^2}$  D)  $\frac{dy}{dx} = \frac{6}{x^5} + \frac{9}{x^2}$

**Evaluate the derivative at the given value of x.**

44) If  $f(x) = -4x^2 + 7x - 5$ , find  $f'(5)$ . 44) \_\_\_\_\_

A) -33 B) -38 C) -5 D) -13

45) If  $y = 4\sqrt{x^3} - 5\sqrt{x}$ , find  $\left. \frac{dy}{dx} \right|_{x=16}$  45) \_\_\_\_\_

A)  $\frac{197}{8}$  B)  $\frac{187}{8}$  C)  $\frac{101}{4}$  D)  $\frac{91}{4}$

46) If  $y = 9\sqrt{x^5} - 7\sqrt{x^3}$ , find  $\left. \frac{dy}{dx} \right|_{x=4}$  46) \_\_\_\_\_

A) 159 B) 6 C) 8 D) 96

47) If  $y = -\frac{8}{x} + \frac{5}{x^2}$ , find  $\left. \frac{dy}{dx} \right|_{x=2}$  47) \_\_\_\_\_

A)  $\frac{3}{4}$  B)  $\frac{13}{4}$  C)  $-\frac{3}{4}$  D)  $-\frac{13}{4}$

**Find the equation of the tangent line to the curve when x has the given value.**

48)  $f(x) = -4 - x^2$ ;  $x = 4$  48) \_\_\_\_\_

A)  $y = 4x + 12$  B)  $y = -8x + 12$  C)  $y = -2x$  D)  $y = 8x - 12$

49)  $f(x) = \frac{x^2}{2}$ ;  $x = 5$  49) \_\_\_\_\_

A)  $y = 5x + 12.5$  B)  $y = 5x - 25$  C)  $y = 10x - 12.5$  D)  $y = 5x - 12.5$

50)  $f(x) = \frac{x^3}{2}; x = 6$  50) \_\_\_\_\_

- A)  $y = 18x + 216$       B)  $y = 216x + 54$       C)  $y = 18x - 216$       D)  $y = 54x - 216$

51)  $f(x) = \frac{32}{x}; x = 2$  51) \_\_\_\_\_

- A)  $y = -8x + 32$       B)  $y = -8x + 16$       C)  $y = -16x + 48$       D)  $y = -8x$

52)  $f(x) = x^2 - 3; x = -4$  52) \_\_\_\_\_

- A)  $y = -4x - 19$       B)  $y = -8x - 35$       C)  $y = -8x - 38$       D)  $y = -8x - 19$

**Solve the problem.**

53) The profit from the expenditure of  $x$  thousand dollars on advertising is given by 53) \_\_\_\_\_

$P(x) = 950 + 25x - 3x^2$ . Find the marginal profit when the expenditure is  $x = 9$ .

- A) 225 thousand dollars      B) 171 thousand dollars  
C) 950 thousand dollars      D) -29 thousand dollars

54) The revenue generated by the sale of  $x$  bicycles is given by  $R(x) = 90.00x - x^2/200$ . Find the 54) \_\_\_\_\_

marginal revenue when  $x = 900$  units.

- A) \$90.00      B) \$10.00      C) \$81.00      D) \$99.00

**Differentiate.**

55)  $y = 7x(9x^4 - 8x)$  55) \_\_\_\_\_

- A)  $\frac{dy}{dx} = 315x^4 - 56x$       B)  $\frac{dy}{dx} = 252x^4 - 112x$   
C)  $\frac{dy}{dx} = 315x^4 - 112x$       D)  $\frac{dy}{dx} = 252x^4 - 56x$

56)  $y = (3 - 3x^2)(5x^2 - 60)$  56) \_\_\_\_\_

- A)  $\frac{dy}{dx} = -60x^3 + 390$       B)  $\frac{dy}{dx} = -60x^3 + 390x$   
C)  $\frac{dy}{dx} = -60x^4 + 390x^2$       D)  $\frac{dy}{dx} = 15x^3 + 195x$

57)  $f(x) = (4x - 2)(4x + 1)$  57) \_\_\_\_\_

- A)  $f'(x) = 32x - 2$       B)  $f'(x) = 16x - 4$       C)  $f'(x) = 32x - 12$       D)  $f'(x) = 32x - 4$

58)  $f(x) = (5x^3 + 5)(2x^7 - 6)$  58) \_\_\_\_\_

- A)  $f'(x) = 100x^9 + 70x^6 - 90x^2$       B)  $f'(x) = 20x^9 + 70x^6 - 90x$   
C)  $f'(x) = 20x^9 + 70x^6 - 90x^2$       D)  $f'(x) = 100x^9 + 70x^6 - 90x$

59)  $f(x) = (3x - 5)(2x^3 - x^2 + 1)$  59) \_\_\_\_\_

- A)  $f'(x) = 18x^3 + 39x^2 - 13x + 3$       B)  $f'(x) = 24x^3 - 13x^2 + 39x + 3$   
C)  $f'(x) = 6x^3 + 13x^2 - 39x + 3$       D)  $f'(x) = 24x^3 - 39x^2 + 10x + 3$

- 60)  $f(x) = (3x + 5)^2$  60) \_\_\_\_\_  
 A)  $f'(x) = 6x + 10$  B)  $f'(x) = 9x + 15$  C)  $f'(x) = 9x + 25$  D)  $f'(x) = 18x + 30$
- 61)  $f(x) = (3x^4 + 8)^2$  61) \_\_\_\_\_  
 A)  $f'(x) = 6x^4 + 16$  B)  $f'(x) = 144x^{15} + 96x^3$   
 C)  $f'(x) = 72x^7 + 192x^3$  D)  $f'(x) = 9x^{16} + 64$
- 62)  $y = \frac{x}{2x - 4}$  62) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = -\frac{4}{2x - 4}$  B)  $\frac{dy}{dx} = \frac{4x - 4}{(2x - 4)^2}$   
 C)  $\frac{dy}{dx} = -\frac{4x}{(2x - 4)^2}$  D)  $\frac{dy}{dx} = -\frac{4}{(2x - 4)^2}$
- 63)  $y = \frac{3x - 5}{5x^2 + 1}$  63) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = \frac{-15x^2 + 47x + 8}{(5x^2 + 1)^2}$  B)  $\frac{dy}{dx} = \frac{45x^2 - 50x + 3}{(5x^2 + 1)^2}$   
 C)  $\frac{dy}{dx} = \frac{15x^3 - 30x^2 + 53x}{(5x^2 + 1)^2}$  D)  $\frac{dy}{dx} = \frac{-15x^2 + 50x + 3}{(5x^2 + 1)^2}$
- 64)  $y = \frac{x^3}{x - 1}$  64) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = \frac{2x^3 + 3x^2}{(x - 1)^2}$  B)  $\frac{dy}{dx} = \frac{-2x^3 + 3x^2}{(x - 1)^2}$   
 C)  $\frac{dy}{dx} = \frac{-2x^3 - 3x^2}{(x - 1)^2}$  D)  $\frac{dy}{dx} = \frac{2x^3 - 3x^2}{(x - 1)^2}$
- 65)  $y = \frac{x^2 - 4}{x}$  65) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = 1 + \frac{4}{x^2}$  B)  $\frac{dy}{dx} = 1 - \frac{4}{x^2}$  C)  $\frac{dy}{dx} = x + \frac{4}{x^2}$  D)  $\frac{dy}{dx} = 1 + \frac{4}{x}$
- 66)  $y = \frac{4x + 3}{2x - 1}$  66) \_\_\_\_\_  
 A)  $\frac{dy}{dx} = \frac{2}{2x - 1}$  B)  $\frac{dy}{dx} = -\frac{10x}{(2x - 1)^2}$   
 C)  $\frac{dy}{dx} = -\frac{10}{(2x - 1)^2}$  D)  $\frac{dy}{dx} = \frac{16x + 2}{(2x - 1)^2}$

67)  $g(x) = \frac{x^2 + 5}{x^2 + 6x}$  67) \_\_\_\_\_

A)  $g'(x) = \frac{6x^2 - 10x - 30}{x^2(x + 6)^2}$

B)  $g'(x) = \frac{2x^3 - 5x^2 - 30x}{x^2(x + 6)^2}$

C)  $g'(x) = \frac{4x^3 + 18x^2 + 10x + 30}{x^2(x + 6)^2}$

D)  $g'(x) = \frac{x^4 + 6x^3 + 5x^2 + 30x}{x^2(x + 6)^2}$

68)  $q(t) = \frac{6t}{t^2 - 3t + 6}$  68) \_\_\_\_\_

A)  $q'(t) = \frac{-6(t^2 - 6)}{(t^2 - 3t + 6)^2}$

B)  $q'(t) = \frac{6}{2t - 3}$

C)  $q'(t) = \frac{-6(t^2 - 3t - 6)}{(t^2 - 3t + 6)^2}$

D)  $q'(t) = \frac{-6t^2}{(t^2 - 3t + 6)^2}$

69)  $f(x) = \frac{x + 6}{x - 6}$  69) \_\_\_\_\_

A)  $f'(x) = \frac{-6}{(x - 6)^2}$

B)  $f'(x) = \frac{-12}{(x + 6)^2}$

C)  $f'(x) = \frac{2}{x - 6}$

D)  $f'(x) = \frac{-12}{(x - 6)^2}$

70)  $y = \frac{x^2 - 3x + 2}{x^7 - 2}$  70) \_\_\_\_\_

A)  $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$

B)  $\frac{dy}{dx} = \frac{-5x^8 + 19x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$

C)  $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 13x^6 - 4x + 6}{(x^7 - 2)^2}$

D)  $\frac{dy}{dx} = \frac{-5x^8 + 18x^7 - 14x^6 - 3x + 6}{(x^7 - 2)^2}$

71)  $y = \frac{x^2 + 2x - 2}{x^2 - 2x + 2}$  71) \_\_\_\_\_

A)  $\frac{dy}{dx} = \frac{-4x^2 + 8x}{(x^2 - 2x + 2)^2}$

B)  $\frac{dy}{dx} = \frac{-4x^2 - 8x}{(x^2 - 2x + 2)^2}$

C)  $\frac{dy}{dx} = \frac{4x^2 - 8x}{(x^2 - 2x + 2)^2}$

D)  $\frac{dy}{dx} = \frac{4x^2 + 8x}{(x^2 - 2x + 2)^2}$

**Solve the problem.**

72) The population  $P$ , in thousands, of a small city is given by  $P(t) = \frac{300t}{2t^2 + 5}$ , where  $t$  is the time, in 72) \_\_\_\_\_

months. Find the growth rate.

A)  $P'(t) = \frac{300(2t^2 - 5)}{(2t^2 + 5)^2}$

B)  $P'(t) = \frac{300(5 - 2t^2)}{(2t^2 + 5)^2}$

C)  $P'(t) = \frac{300(5 + 6t^2)}{(2t^2 + 5)^2}$

D)  $P'(t) = \frac{300(5 - 2t^2)}{2t^2 + 5}$

**Differentiate.**

73)  $f(x) = (5x + 3)^2$  73) \_\_\_\_\_  
A)  $f'(x) = 2(5x + 3)$  B)  $f'(x) = 10(5x + 3)^2$   
C)  $f'(x) = 10(5x + 3)$  D)  $f'(x) = 5(5x + 3)$

74)  $f(x) = (-5x - 2)^4$  74) \_\_\_\_\_  
A)  $f'(x) = -20(-5x - 2)^3$  B)  $f'(x) = 4(-5x - 2)^3$   
C)  $f'(x) = -5(-5x - 2)^3$  D)  $f'(x) = -20(-5x - 2)^4$

75)  $f(x) = (3 - 5x)^{130}$  75) \_\_\_\_\_  
A)  $f'(x) = -650(3 - 5x)^{130}$  B)  $f'(x) = 650(3 - 5x)^{129}$   
C)  $f'(x) = 130(3 - 5x)^{129}$  D)  $f'(x) = -650(3 - 5x)^{129}$

76)  $f(x) = (2x^2 + 2)^3$  76) \_\_\_\_\_  
A)  $f'(x) = 12(2x^2 + 2)^2$  B)  $f'(x) = (12x + 2)(2x^2 + 2)^2$   
C)  $f'(x) = 12x(2x^2 + 2)^2$  D)  $f'(x) = 3(2x^2 + 2)^2$

77)  $f(x) = \sqrt{1 - 18x}$  77) \_\_\_\_\_  
A)  $f'(x) = -\frac{18}{\sqrt{1 - 18x}}$  B)  $f'(x) = -\frac{9x}{\sqrt{1 - 18x}}$   
C)  $f'(x) = -\frac{9}{\sqrt{1 - 18x}}$  D)  $f'(x) = \frac{1}{2\sqrt{1 - 18x}}$

78)  $f(x) = \sqrt[3]{2x^2 - x}$  78) \_\_\_\_\_  
A)  $f'(x) = \frac{1}{3(2x^2 - x)^{2/3}}$  B)  $f'(x) = \frac{4x}{(2x^2 - x)^{2/3}}$   
C)  $f'(x) = \frac{4x - 1}{3(2x^2 - x)^{1/3}}$  D)  $f'(x) = \frac{4x - 1}{3(2x^2 - x)^{2/3}}$

79)  $f(x) = \frac{1}{\sqrt{4x + 7}}$  79) \_\_\_\_\_  
A)  $f'(x) = -\frac{2}{(4x + 7)^{3/2}}$  B)  $f'(x) = -\frac{2}{(4x + 7)^{1/2}}$   
C)  $f'(x) = -\frac{1}{2(4x + 7)^{3/2}}$  D)  $f'(x) = \frac{4}{(4x + 7)^{3/2}}$

80)  $f(x) = \sqrt{12x - x^3}$  80) \_\_\_\_\_  
A)  $f'(x) = \frac{12 - 3x^2}{2\sqrt{12x - x^3}}$  B)  $f'(x) = \frac{1}{2\sqrt{12x - x^3}}$   
C)  $f'(x) = \frac{-3x^2}{\sqrt{12x - x^3}}$  D)  $f'(x) = \frac{1}{2\sqrt{12 - 3x^2}}$

$$81) f(x) = \frac{1}{(3x^2 - 7x + 2)^3}$$

81) \_\_\_\_\_

A)  $f'(x) = -\frac{3(6x - 7)}{(3x^2 - 7x + 2)^4}$

B)  $f'(x) = \frac{(6x - 7)}{(3x^2 - 7x + 2)^4}$

C)  $f'(x) = -\frac{3(6x - 7)}{(3x^2 - 7x + 2)^3}$

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

Find  $\frac{d^2y}{dx^2}$ .

82)  $y = 2x + 4$

82) \_\_\_\_\_

A)  $2x^3 + 4x^2$

B) 2

C)  $\frac{2}{x}$

D) 0

83)  $y = 5x^2 + 5x - 2$

83) \_\_\_\_\_

A) 5

B) 0

C) 10

D)  $10x + 5$

84)  $y = 2x^4 - 6x^2 + 6$

84) \_\_\_\_\_

A)  $8x^2 - 12x$

B)  $24x^2 - 12x$

C)  $24x^2 - 12$

D)  $8x^2 - 12$

85)  $y = 2x^{3/2} - 6x^{1/2}$

85) \_\_\_\_\_

A)  $1.5x^{-1/2} + 1.5x^{-3/2}$

B)  $3x^{1/2} - 3x^{-1/2}$

C)  $3x^{-1/2} + 3x^{-3/2}$

D)  $1.5x^{1/2} + 1.5x^{-1/2}$

Find the indicated derivative of the function.

86)  $\frac{d^3y}{dx^3}$  of  $y = 3x^3 + 6x^2 - 5x$

86) \_\_\_\_\_

A)  $18x + 9$

B) 9

C) 18

D)  $9x + 18$

87)  $\frac{d^4y}{dx^4}$  of  $y = 3x^5 - 5x^2 - 3x + 1$

87) \_\_\_\_\_

A)  $240x + 10$

B)  $360x$

C)  $180x$

D)  $240x^2 + 10$

88)  $\frac{d^4y}{dx^4}$  of  $y = 2x^6 - 2x^4 + 4x^2$

88) \_\_\_\_\_

A)  $720x^2 - 48$

B)  $480x^2 - 24$

C)  $720x^2 - 48x$

D)  $480x^2 - 24x$

89)  $\frac{d^4y}{dx^4}$  of  $y = 3\sqrt{x}$

89) \_\_\_\_\_

A)  $-\frac{81}{80x^{11/3}}$

B)  $-\frac{80}{81x^{11/3}}$

C)  $\frac{80}{81x^{11/3}}$

D)  $\frac{81}{80x^{11/3}}$

90)  $\frac{d^5y}{dx^5}$  of  $y = 5x^6 + 4x^4 + 3x^2 - 4$  90) \_\_\_\_\_  
 A) 3600                      B) 0                      C)  $3600x$                       D)  $1800x^2 + 96$

91)  $\frac{d^6y}{dx^6}$  of  $y = 3x^7 - 5x^5 - 3x^3 - 1$  91) \_\_\_\_\_  
 A) 15,120                      B) 15,120x                      C) 0                      D)  $7560x^2 - 600$

**Solve the problem.**

92) If  $s$  is a distance given by  $s(t) = t^2 + 2t + 30$ , find the acceleration,  $a(t)$ . 92) \_\_\_\_\_  
 A)  $a(t) = 2t$                       B)  $a(t) = 2t + 2$                       C)  $a(t) = 2$                       D)  $a(t) = 30$

93) If  $s$  is a distance given by  $s(t) = 6t^3 + t + 4$ , find the acceleration,  $a(t)$ . 93) \_\_\_\_\_  
 A)  $a(t) = 18t^2 + 1$                       B)  $a(t) = 3t^2 + 1$                       C)  $a(t) = 18t$                       D)  $a(t) = 36t$

94) If  $s$  is a distance given by  $s(t) = 4t^3 + 9t^2 + 4t$ , find the acceleration,  $a(t)$ . 94) \_\_\_\_\_  
 A)  $a(t) = 42t + 4$                       B)  $a(t) = 24t$                       C)  $a(t) = 12t^2 + 18t$                       D)  $a(t) = 24t + 18$

95) If  $s$  is a distance given by  $s(t) = 4t^4 + 8t^3 + 4t$ , find the acceleration,  $a(t)$ . 95) \_\_\_\_\_  
 A)  $a(t) = 16t^3 + 24t^2 + 4$                       B)  $a(t) = 48t + 48$   
 C)  $a(t) = 16t^2 + 24t$                       D)  $a(t) = 48t^2 + 48t$

96) If  $s$  is a distance given by  $s(t) = 4t^4 + 6t^2 + 2t$ , find the acceleration,  $a(t)$ . 96) \_\_\_\_\_  
 A)  $a(t) = 16t^2 + 12t + 2$                       B)  $a(t) = 48t + 12$   
 C)  $a(t) = 48t^2 + 12$                       D)  $a(t) = 16t^3 + 12t + 2$

97) A population grows from an initial size of 10 people to an amount  $P(t)$ , given by  $P(t) = 10(2 + 0.5t + t^3)$ , where  $t$  is measured in years from 1996. Find the acceleration in the population  $t$  years from 1996. 97) \_\_\_\_\_  
 A)  $(5 + 30t^2)$  people per year<sup>2</sup>                      B)  $60t$  people per year<sup>2</sup>  
 C)  $60$  people per year<sup>2</sup>                      D)  $30t$  people per year<sup>2</sup>

98) A population grows from an initial size of 2 people to an amount  $P(t)$ , given by  $P(t) = 2(1 + 3t + t^3)$ , where  $t$  is measured in years from 1993. Find the acceleration in the population  $t$  years from 1993. 98) \_\_\_\_\_  
 A)  $(6 + 3t^2)$  people per year<sup>2</sup>                      B)  $12t$  people per year<sup>2</sup>  
 C)  $(6 + 6t^2)$  people per year<sup>2</sup>                      D)  $3t$  people per year<sup>2</sup>

99) A population grows from an initial size of 0.8 people to an amount  $P(t)$ , given by  $P(t) = 0.8(8 + 0.4t + t^3)$ , where  $t$  is measured in years from 1991. How rapidly is the growth rate of the population increasing  $t$  years from 1991? 99) \_\_\_\_\_  
 A)  $0.32 + 2.4t^2$                       B) 4.8                      C)  $0.32 + 2.4t$                       D) 4.8t