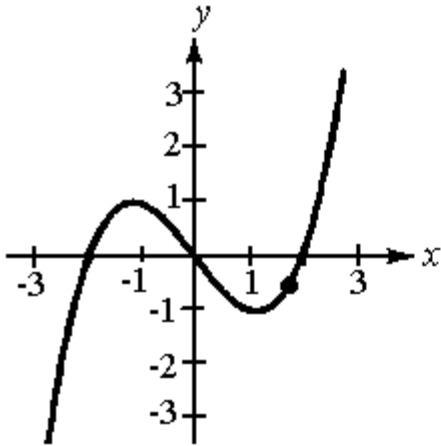


1. Determine whether the slope at the indicated point is positive, negative, or zero.
  - a. None of these
  - b. Zero
  - c. No slope
  - d. Negative
  - e. Positive



2. If  $f(x) = 2x^2 + 4$ , which of the following will calculate the derivative of  $f(x)$ ?
  - a. 
$$\lim_{\Delta x \rightarrow 0} \frac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$$
  - b. 
$$\frac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$$
  - c. 
$$\lim_{\Delta x \rightarrow 0} \frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$$
  - d. 
$$\frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$$
  - e. None of these
3. Find an equation of the tangent line to the graph of  $f(x) = x^2 - 2x - 3$  at the point  $(-2, 5)$ .
4. Find  $f'(x)$ :  $f(x) = 4x^4 - 5x^3 + 2x - 3$ .
  - a.  $16x^3 - 15x^2 + 2$
  - b. None of these
  - c.  $16x^3 - 15x^2 + 2x - 3$
  - d.  $4x^4 - 5x^3 + 2x$
  - e.  $4x^3 - 5x^2 + 2$

5. Find  $f'(x)$ :  $f(x) = \frac{1}{x^2}$ .

- a.  $\frac{2}{x}$
- b. None of these
- c.  $\frac{1}{x}$
- d.  $-\frac{1}{x^3}$
- e.  $-\frac{2}{x^3}$

6. Let  $g(x) = 9f(x)$  and let  $f'(-6) = -6$ . Find  $g'(-6)$ .

- a. -6
- b. 9
- c. -54
- d. None of these
- e. 0

7. Find the instantaneous rate of change of  $w$  with respect to  $z$  for

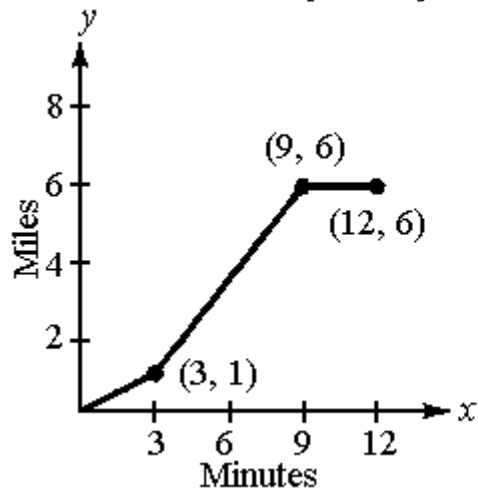
$$w = \frac{1}{z} + \frac{z}{2}$$

- a.  $\frac{z^2 - 2}{2z^2}$
- b.  $\frac{3}{2}$
- c. None of these
- d. -2
- e.  $-\frac{1}{z^2}$

8. Find an equation for the tangent line to the graph of  $f(x) = -2x^2 + 2x + 3$  at the point where  $x = 1$ .

- a.  $y = -4x + 2$
- b.  $y = -4x^2 + 2x + 1$
- c. None of these
- d.  $2x + y - 1 = 0$
- e.  $2x + y = 5$

9. Find the point(s) on the graph of the function  $f(x) = x^3 - 2$  where the slope is 3.
- $(1, 3), (-1, 3)$
  - $(1, -1), (-1, -3)$
  - $(\sqrt[3]{2}, 0)$
  - $(1, 3)$
  - None of these
10. Suppose the position equation for a moving object is given by  $s(t) = 3t^2 + 2t + 5$  where  $s$  is measured in meters and  $t$  is measured in seconds. Find the velocity of the object when  $t = 2$ .
- 10 m/sec
  - 6 m/sec
  - None of these
  - 14 m/sec
  - 13 m/sec
11. Find the average rate of change of  $y$  with respect to  $x$  on the interval  $[0, 5]$ , where  $y = 2x^2 + x - 3$ .
12. Find  $\frac{dy}{dx}$ :  $y = 4 \sin x - 5 \cos x + x$ .
- $4 \cos x + 5 \sin x$
  - $-4 \cos x + 5 \sin x + 1$
  - None of these
  - $4 \cos x + 5 \sin x + 1$
  - $4 \cos x - 5 \sin x + 1$
13. The given graph of a position function represents the distance in miles that a person drives during a 12-minute drive to school. Make a sketch of the corresponding velocity function.



14. Differentiate:  $y = \frac{3x}{x^2 + 1}$ .

a.  $\frac{3(1 - x^2)}{(1 + x^2)^2}$

b.  $\frac{3}{2x}$

c. None of these

d.  $\frac{3x^2 - 3}{(1 + x^2)^3}$

e.  $\frac{3}{1 + x^2}$

15. Let  $f(7) = 0$ ,  $f'(7) = 14$ ,  $g(7) = 1$  and  $g'(7) = \frac{1}{7}$ . Find  $h'(7)$  if

$$h(x) = f(x)/g(x).$$

a. -2

b. 14

c. -14

d. 98

e. None of these

16. If  $f''(x) = -2x^2 + 7x - 2$ , find  $f^{(4)}(x)$ .

a.  $-4x + 7$

b. -4

c.  $-2x + 7$

d. None of these

e. 0

17. Find  $y''$  for  $y = \frac{\csc x}{2}$ .

18. Find  $\frac{dy}{dx}$  for  $y = \sqrt{x}(3x - 1)$ .

a.  $\frac{3}{2\sqrt{x}}$

b.  $\frac{3\sqrt{x}}{2}$

c.  $\frac{9\sqrt{x} - 1}{2}$

d.  $\frac{9x - 1}{2\sqrt{x}}$

e. None of these

19. Find the derivative of  $y = (x^2 + 2x + 5)^6$ .

20. A particle moves along the curve given by  $y = \sqrt{t^3 + 1}$ . Find the acceleration when  $t = 2$  seconds.

a.  $-\frac{1}{9}$  units/sec<sup>2</sup>

b.  $-\frac{2}{3}$  units/sec<sup>2</sup>

c. None of these

d. 3 units/sec<sup>2</sup>

e.  $-\frac{1}{108}$  units/sec<sup>2</sup>

21. Let  $f(x) = \sqrt{x^2 + 1}$ .

**a.** Calculate  $f'(x)$ .

**b.** Use a graphing utility to graph  $f$  and  $f'$  on the same axes.

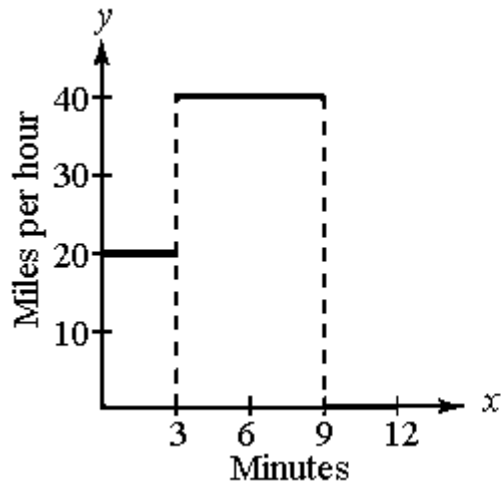
**c.** Use the graph to determine those point(s) where  $f$  has a horizontal tangent line.

**d.** Give the value of  $f'$  at each of the points found in part **c**.

22. Find  $\frac{dy}{dx}$  for  $2x^2 + xy + 3y^2 = 0$ .
- $\frac{4x + y}{x + 6y}$
  - None of these
  - $\frac{4x + 6y}{-x}$
  - $\frac{4x + y + 6y}{4x + y}$
  - $\frac{4x + y}{6y}$
23. Find  $\frac{dy}{dx}$  if  $x\sqrt{y} + y^2 = x$ .
24. Find the slope of the curve  $y^4 - xy^2 = x$  at the point  $\left(\frac{1}{2}, 1\right)$ .
25. A point moves along the curve  $y = 2x^2 - 1$  in such a way that the  $y$  value is decreasing at the rate of 2 units per second. At what rate is  $x$  changing when  $x = -\frac{3}{2}$ ?
- Decreasing  $\frac{1}{3}$  unit/sec
  - Decreasing  $\frac{7}{2}$  unit/sec
  - None of these
  - Increasing  $\frac{7}{2}$  unit/sec
  - Increasing  $\frac{1}{3}$  unit/sec
26. As a balloon in the shape of a sphere is being blown up, the radius is increasing  $\frac{1}{\pi}$  inches per second. At what rate is the volume increasing when the radius is 1 inch?
- 3 in.<sup>3</sup>/sec
  - $4\pi$  in.<sup>3</sup>/sec
  - $3\pi$  in.<sup>3</sup>/sec
  - None of these
  - 4 in.<sup>3</sup>/sec

27. Two boats leave the same port at the same time with one boat traveling north at 15 knots per hour and the other boat traveling west at 12 knots per hour. How fast is the distance between the two boats changing after 2 hours?
- a. 19.2 knots/hr
  - b. 38.4 knots/hr
  - c. 26.8 knots/hr
  - d. 17.7 knots/hr
  - e. None of these
28. The height of a cylinder with a radius of 4 cm is increasing at a rate of 2 centimeters per minute. Find the rate of change of the volume of the cylinder with respect to time when the height is 10 centimeters.
- a.  $\frac{1}{16\pi}$  cm<sup>3</sup>/min
  - b. None of these
  - c.  $16\pi$  cm<sup>3</sup>/min
  - d.  $\frac{5}{8\pi}$  cm<sup>3</sup>/min
  - e.  $160\pi$  cm<sup>3</sup>/sec

1. e
2. a
3.  $6x + y + 7 = 0$
4. a
5. e
6. c
7. a
8. e
9. b
10. d
11. 11
12. d
13. See graph below.



14. a
15. b
16. b
17.  $\frac{1}{2}(\csc x)(2 \csc^2 x - 1)$
18. d
19.  $12(x + 1)(x^2 + 2x + 5)^5$
20. b
21.
  - a.  $\frac{x}{\sqrt{x^2 + 1}}$
  - b. student to sketch graph
  - c.  $(0, 1)$
  - d. 0
22. a
23.  $\frac{2\sqrt{y} - 2y}{2y\sqrt{y + x}}$

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- 24.  $\frac{2}{3}$
- 25. e
- 26. e
- 27. a
- 28. b