Name: ___________________________ Date: _____________

1. Find the slope of the tangent line to the graph of the function below at the given point.

   $f(x) = -5x - 7, \quad (-3, 8)$

2. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

   $y(x) = x^4 - 4x + 5$

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

   $y = \sqrt[5]{6x^5 + 4x}\ , \quad x = 4$

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

   $f(x) = \tan^5 x\ , \quad \left(\frac{4\pi}{3}, 15.588\right)$

   The coefficients below are given to two decimal places.

5. Find the second derivative of the function.

   $R(x) = \frac{6x^2 + 5x - 5}{x}$

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

   $y = \sin 6x$

   such that *dx/dt* = 9 centimeters per second.

   Find *dy/dt* when $x = \frac{\pi}{11}$.

7. Find the derivative of the function.

$$y = -8\sin 5x$$

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

$$f(x) = -3x^2 + 8x - 9$$

9. Find the second derivative of the function.

$$Q(v) = v^6 \sec v$$

10. Find the derivative of the function.

$$y = -2\cos 2x$$

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

$$f(x) = \sqrt{7x + 9}$$

12. Find *dy/dx* by implicit differentiation and evaluate it at the given point.

$$x^4 - 6y^2 = -5, \quad \left(4, \sqrt{\frac{87}{2}}\right)$$

13. Find the second derivative of the function.

$$f(x) = 5x^{\frac{6}{7}}$$

14. Find the derivative of the function.

$$f(x) = 3x^2 - 2\cos(x)$$

15. Use the product rule to differentiate.

$$g(v) = v^3 \cos v$$

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

$$y = \frac{1}{5x^2 + 3}$$

such that *dx/dt* = 3 centimeters per second.

Find *dy/dt* when $x = 3$.

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

$$f(x) = -2(2x+3)^2 \text{ when } x = 3$$

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

$$f''(x) = 3x^{\frac{4}{7}}, \quad f^{(iv)}(x)$$

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

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

20. The length of a rectangle is $4t + 4$ and its height is $t^4$, where *t* is time in seconds and the dimensions are in inches. Find the rate of change of area, *A,* with respect to time.

21. Find the derivative of the function.

$$y = \frac{4}{5}\sec^2 x$$

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

$$f(t)=\frac{7}{t-1}\ ,\quad \left(5,\frac{7}{4}\right)$$

23. Use the product rule to differentiate.

$$P(x)=x^{-3}\sin\ x$$

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

$$f(x)=-3x^2+8x-\frac{6}{x^2}\ \text{when}\ x=-5$$

25. Determine the point(s), (if any), at which the graph of the function has a horizontal tangent.

$$y(x)=x^3+15x^2+8$$

26. Find the derivative of the function.

$$Q(s)=20s^5+6\sec(s)$$

27. Find the derivative of the algebraic function.

$$Q(v)=\left(v^5+3\right)^6$$

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

$$x^{2/5}+y^{3/2}=4$$

29. Use the product rule to differentiate.

$$f(r)=\sqrt{r}\left(4-r^6\right)$$

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

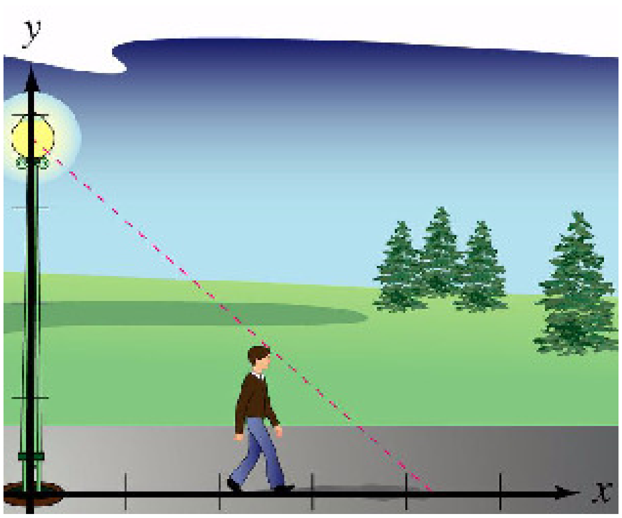
$R(s) = s^{\frac{4}{7}} - s^{\frac{3}{4}}$ when $s = 7$

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

$f(x) = -5x^3 - 8x^2$ when $x = 2$

32. ***Shadow Length*** 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 11 ft from the base of the light find the following.

(a) The rate the tip of the shadow is moving.
(b) The rate the length of his shadow is changing.




(a) (b)

33. ***Depth*** A conical tank (with vertex down) is 10 ft across the top and 11 ft deep. If water is flowing into the tank at a rate of 10 cubic ft per minute, find the rate of change of depth of water when the water is 2 ft deep.

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

$4 - 8xy = 11x - 5y$

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

$$\sin x + 4\cos 15y = 6$$

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

$$f(x) = (5x^3 + 5)^2, \quad (1,100)$$

37. Find the derivative of the function.

$$y = \cos\left(3x^6 - 7\right)$$

38. Find the derivative of the trigonometric function.

$$R(v) = v^3 \tan v$$

39. Use the quotient rule to differentiate the following function and evaluate $Q'(-3)$.

$$Q(s) = \frac{2s}{s^4 + 6}$$

40. Find the derivative of the algebraic function.

$$R(x) = x\left(2 - \frac{5}{x+8}\right)$$

## Answer Key

1. $-5$
2. $1$
3. $y'(4) = \dfrac{7684}{5(6160)^{\frac{4}{5}}}$
4. $y = 180.00x - 738.39$
5. $R''(x) = -\dfrac{10}{x^3}$
6. $\dfrac{dy}{dt} = 54\cos\left(\dfrac{6\pi}{11}\right)$
7. $y' = -40\cos 5x$
8. $f'(x) = -6x + 8$
9. $Q''(v) = v^4 \sec v(30 + v^2 \sec^2 v + 12v \tan v + v^2 \tan^2 v)$
10. $y' = 4\sin 2x$
11. $f'(x) = \dfrac{7}{2\sqrt{7x+9}}$
12. $\left.\dfrac{dy}{dx}\right|_{x=4} = \dfrac{64}{3\left(\sqrt{\dfrac{87}{2}}\right)}$
13. $f''(x) = \dfrac{-30}{49} x^{\frac{-8}{7}}$
14. $f'(x) = 6x + 2\sin(x)$
15. $g'(v) = -v^3 \sin v + 3v^2 \cos v$
16. $\dfrac{dy}{dt} = -\dfrac{5}{128}$
17. $f'(3) = -72$
18. $f^{(iv)}(x) = \dfrac{-6120}{2401} x^{\frac{-24}{7}}$
19. $f'(x) = -15x^2 - 6x$
20. $\dfrac{dA}{dt} = t^3(16 + 20t)$ square inches/second
21. $y' = \dfrac{8}{5}\sec^2 x \tan x$
22. $f'(5) = -\dfrac{7}{16}$
23. $P'(x) = x^{-3}\cos x - 3x^{-4}\sin x$
24. $f'(-5) = \dfrac{4738}{125}$

25. $0$ and $-10$

26. $Q'(s)=100s^4+6\sec(s)\tan(s)$

27. $Q'(v)=30v^4(v^5+3)^5$

28. $\dfrac{dy}{dx}=-\dfrac{4x^{-3/5}}{15y^{1/2}}$

29. $f'(r)=-6r^{5.5}+\dfrac{4-r^6}{2\sqrt{r}}$

30. $R'(7)=\dfrac{4}{7(7)^{\frac{3}{7}}}-\dfrac{3}{4(7)^{\frac{1}{4}}}$

31. $f'(2)=-92$

32.

$\dfrac{48}{11}$ ft per minute $\dfrac{15}{11}$ ft per minute

33. $\dfrac{121}{10\pi}$ ft per minute

34. $\dfrac{d^2y}{dx^2}=\dfrac{368}{(5-8x)^3}$

35. $\dfrac{dy}{dx}=\dfrac{\cos x}{60\sin 15y}$

36. $y=300x-200$

37. $y'=-18x^5\sin(3x^6-7)$

38. $R'(v)=v^3\sec^2 v+3v^2\tan v$

39. $Q'(-3)=-\dfrac{158}{2523}$

40. $R'(x)=\dfrac{88+32x+2x^2}{(x+8)^2}$