Tangent Line Equations (CALC.DIF.05)

1. Write an equation of the tangent line to the graph of $f(x)$ at the given value of x.

$$f(x) = \frac{1}{2}x^4 - 3x + 6 \qquad x = 1$$

2. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.

$$g(x) = \frac{1}{x} - \frac{1}{x^2} \qquad x = -2$$

3. Write an equation of the tangent line to the graph of $f(x)$ at the given value of x.

$$f(x) = x^2 \cdot \sin x \qquad x = \frac{\pi}{2}$$

4. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.

$$g(x) = \frac{1}{x} - \sqrt{\cos x} \qquad x = \frac{\pi}{3}$$

5. Write an equation of the tangent line to the graph of $f(x)$ at the given value of x.

$$f(x) = \sqrt{x^2 + x} \qquad x = 1$$

6. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.

$$g(x) = x \cdot \ln x^2 \qquad x = 1$$

7. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.

$$g(x) = \sqrt{x} - \frac{1}{4}e^x \qquad x = \ln 16$$

8. Write an equation of the tangent line to the graph of $h(x)$ at the given value of x.

$$h(x) = (\ln x)^3 \qquad x = e^3$$

9. Write an equation of the tangent line to the graph of $f(x)$ at the given value of x.

$$f(x) = 2x + e^{2x} \qquad x = 0$$

10. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.

$$g(x) = x(e^{2x} - e^x) \qquad x = -1$$

11. Write an equation of the tangent line to the graph of $f(x)$ at the given value of x.
$$f(x) = x^4 - 4x^3 + 5x + 3 \qquad x = 1$$

12. Write an equation of the tangent line to the graph of $g(x)$ at the given value of x.
$$g(x) = \frac{1 + \sec x}{1 - \sec x} \qquad x = \frac{3\pi}{4}$$

13. Determine the point of tangency where the function has a horizontal tangent line.
$$f(x) = \ln \sqrt{\frac{e^{x-1}}{x+1}}$$

14. Find k such that the line is tangent to the graph of the function.
$$f(x) = kx^2 \qquad y = -4x + 5$$

15. Find k such that the line is tangent to the graph of the function.
$$f(x) = kx^{2/3} \qquad y = -2x - 8$$

16. Find equations of the tangent lines to the graph of $p(x)$ that are parallel to the given line.
$$p(x) = 2x^3 - 5x^2 + 3x - 9 \qquad 21x - 3y = -25$$

17. Find equations of the tangent lines to the graph of $f(x)$ that are parallel to the given line.
$$f(x) = \frac{x - 2}{x + 2} \qquad 8x - 2y = -13$$

18. The given curve is called a **Witch of Agnesi**. Find an equation of the tangent line to this curve at the given point.
$$y = \frac{1}{1 + x^2} \qquad P\left(-2, \frac{1}{5}\right)$$

19. Graph $f(x)$ and $g(x)$ in the same coordinate plane. Find equations of the two lines that are simultaneously tangent to both parabolas.
$$f(x) = -x^2 \qquad g(x) = x^2 - 2x + 5$$

20. Show that the graph of the function does not have a horizontal tangent line.
$$f(x) = 5x + \cos x - 4$$