

1. Find the equation of the tangent line of the slope $m = 2$ to the graph of the function: $f(x) = 4\sqrt{4x + 5}$. Find also the point of tangency Q .
2. Find the equation of the tangent line of the slope $m = -3$ to the graph of the function: $f(x) = 2\sqrt{-x}$. Find also the point of tangency Q .
3. Find the equation of the tangent line of the slope $m = -5$ to the graph of the function: $f(x) = -5\sqrt{4x + 1}$. Find also the point of tangency Q .
4. Find the equation of the tangent line of the slope $m = -2$ to the graph of the function: $f(x) = -3\sqrt{4x - 2}$. Find also the point of tangency Q .
5. Find the equation of the tangent line of the slope $m = -5$ to the graph of the function: $f(x) = -\sqrt{5x + 4}$. Find also the point of tangency Q .
6. Find the equation of the tangent line of the slope $m = 4$ to the graph of the function: $f(x) = \sqrt{5x - 1}$. Find also the point of tangency Q .
7. Find the equation of the tangent line of the slope $m = 3$ to the graph of the function: $f(x) = 5\sqrt{5x - 4}$. Find also the point of tangency Q .
8. Find the equation of the tangent line of the slope $m = -2$ to the graph of the function: $f(x) = -5\sqrt{5x - 5}$. Find also the point of tangency Q .
9. Find the equation of the tangent line of the slope $m = -3$ to the graph of the function: $f(x) = -\sqrt{5x - 4}$. Find also the point of tangency Q .
10. Find the equation of the tangent line of the slope $m = -1$ to the graph of the function: $f(x) = -2\sqrt{4x - 2}$. Find also the point of tangency Q .

$\left(8, \frac{7}{6}\right) = Q \quad \frac{7}{-7} + x = y \quad 10.$	$\left(\frac{9}{-5}, \frac{181}{69}\right) = Q \quad \frac{69}{119} + x = y \quad 9.$
$\left(\frac{4}{-125}, \frac{16}{141}\right) = Q \quad \frac{8}{-109} + x = y \quad 8.$	$\left(\frac{6}{125}, \frac{181}{769}\right) = Q \quad \frac{69}{481} + x = y \quad 7.$
$\left(\frac{8}{5}, \frac{323}{89}\right) = Q \quad \frac{80}{-39} + x = y \quad 6.$	$\left(\frac{7}{-1}, \frac{4}{-3}\right) = Q \quad \frac{4}{-17} + x = y \quad 5.$
$\left(-9, \frac{4}{11}\right) = Q \quad \frac{7}{-7} + x = y \quad 4.$	$\left(\frac{4}{-10}, \frac{3}{-10}\right) = Q \quad \frac{4}{-25} + x = y \quad 3.$
$\left(-1, \frac{6}{2}\right) = Q \quad \frac{3}{1} + x = y \quad 2.$	$\left(\frac{4}{11}, 16\right) = Q \quad \frac{7}{21} + x = y \quad 1.$

ANSWERS:

Solutions:

$$1. f'(x) = \frac{d}{dx} 4\sqrt{4x+5} = \frac{(4)(4)}{2\sqrt{4x+5}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$2 = \frac{(4)(4)}{2\sqrt{4x+5}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{4x+5} = \frac{(4)(4)}{2(2)} = 4 \quad 4x+5 = 16 \quad x = \frac{11}{4} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{11}{4} \quad y_1 = 4\sqrt{4\left(\frac{11}{4}\right) + 5} = 16 \quad Q = \left(\frac{11}{4}, 16\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - (16) = 2 \left[x - \left(\frac{11}{4}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = 2x + \frac{21}{2} \quad \text{Point of tangency: } Q = \left(\frac{11}{4}, 16\right)$$

$$2. f'(x) = \frac{d}{dx} 2\sqrt{-x} = \frac{(2)(-1)}{2\sqrt{-x}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-3 = \frac{(2)(-1)}{2\sqrt{-x}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{-x} = \frac{(2)(-1)}{2(-3)} = \frac{1}{3} \quad -x = \frac{1}{9} \quad x = \frac{-1}{9} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{-1}{9} \quad y_1 = 2\sqrt{-\left(\frac{-1}{9}\right) + 0} = \frac{2}{3} \quad Q = \left(\frac{-1}{9}, \frac{2}{3}\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - \left(\frac{2}{3}\right) = -3 \left[x - \left(\frac{-1}{9}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = -3x + \frac{1}{3} \quad \text{Point of tangency: } Q = \left(\frac{-1}{9}, \frac{2}{3}\right)$$

$$3. f'(x) = \frac{d}{dx} -5\sqrt{4x+1} = \frac{(-5)(4)}{2\sqrt{4x+1}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-5 = \frac{(-5)(4)}{2\sqrt{4x+1}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{4x+1} = \frac{(-5)(4)}{2(-5)} = 2 \quad 4x+1 = 4 \quad x = \frac{3}{4} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{3}{4} \quad y_1 = -5\sqrt{4\left(\frac{3}{4}\right) + 1} = -10 \quad Q = \left(\frac{3}{4}, -10\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - (-10) = -5 \left[x - \left(\frac{3}{4}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = -5x + \frac{-25}{4} \quad \text{Point of tangency: } Q = \left(\frac{3}{4}, -10\right)$$

$$4. f'(x) = \frac{d}{dx} -3\sqrt{4x-2} = \frac{(-3)(4)}{2\sqrt{4x-2}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-2 = \frac{(-3)(4)}{2\sqrt{4x-2}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{4x-2} = \frac{(-3)(4)}{2(-2)} = 3 \quad 4x-2=9 \quad x = \frac{11}{4} \quad \blacktriangleleft \text{Solve for } x$$

$$x_1 = \frac{11}{4} \quad y_1 = -3\sqrt{4\left(\frac{11}{4}\right)-2} = -9 \quad Q = \left(\frac{11}{4}, -9\right) \quad \blacktriangleleft \text{Find the point of tangency.}$$

$$y - (-9) = -2 \left[x - \left(\frac{11}{4}\right) \right] \quad \blacktriangleleft \text{Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{Simplify:}$$

$$\text{Equation of tangent line: } y = -2x + \frac{-7}{2} \quad \text{Point of tangency: } Q = \left(\frac{11}{4}, -9\right)$$

$$5. f'(x) = \frac{d}{dx} -\sqrt{5x+4} = \frac{(-1)(5)}{2\sqrt{5x+4}} \quad \blacktriangleleft \text{Find the first derivative of the function.}$$

$$-5 = \frac{(-1)(5)}{2\sqrt{5x+4}} \quad \blacktriangleleft \text{Use } m = f'(x)$$

$$\sqrt{5x+4} = \frac{(-1)(5)}{2(-5)} = \frac{1}{2} \quad 5x+4 = \frac{1}{4} \quad x = \frac{-3}{4} \quad \blacktriangleleft \text{Solve for } x$$

$$x_1 = \frac{-3}{4} \quad y_1 = -\sqrt{5\left(\frac{-3}{4}\right)+4} = \frac{-1}{2} \quad Q = \left(\frac{-3}{4}, \frac{-1}{2}\right) \quad \blacktriangleleft \text{Find the point of tangency.}$$

$$y - \left(\frac{-1}{2}\right) = -5 \left[x - \left(\frac{-3}{4}\right) \right] \quad \blacktriangleleft \text{Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{Simplify:}$$

$$\text{Equation of tangent line: } y = -5x + \frac{-17}{4} \quad \text{Point of tangency: } Q = \left(\frac{-3}{4}, \frac{-1}{2}\right)$$

$$6. f'(x) = \frac{d}{dx} \sqrt{5x-1} = \frac{(1)(5)}{2\sqrt{5x-1}} \quad \blacktriangleleft \text{Find the first derivative of the function.}$$

$$4 = \frac{(1)(5)}{2\sqrt{5x-1}} \quad \blacktriangleleft \text{Use } m = f'(x)$$

$$\sqrt{5x-1} = \frac{(1)(5)}{2(4)} = \frac{5}{8} \quad 5x-1 = \frac{25}{64} \quad x = \frac{89}{320} \quad \blacktriangleleft \text{Solve for } x$$

$$x_1 = \frac{89}{320} \quad y_1 = \sqrt{5\left(\frac{89}{320}\right)-1} = \frac{5}{8} \quad Q = \left(\frac{89}{320}, \frac{5}{8}\right) \quad \blacktriangleleft \text{Find the point of tangency.}$$

$$y - \left(\frac{5}{8}\right) = 4 \left[x - \left(\frac{89}{320}\right) \right] \quad \blacktriangleleft \text{Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{Simplify:}$$

$$\text{Equation of tangent line: } y = 4x + \frac{-39}{80} \quad \text{Point of tangency: } Q = \left(\frac{89}{320}, \frac{5}{8}\right)$$

$$7. f'(x) = \frac{d}{dx} 5\sqrt{5x-4} = \frac{(5)(5)}{2\sqrt{5x-4}} \quad \blacktriangleleft \text{Find the first derivative of the function.}$$

$$3 = \frac{(5)(5)}{2\sqrt{5x-4}} \quad \blacktriangleleft \text{Use } m = f'(x)$$

$$\sqrt{5x-4} = \frac{(5)(5)}{2(3)} = \frac{25}{6} \quad 5x-4 = \frac{625}{36} \quad x = \frac{769}{180} \quad \blacktriangleleft \text{Solve for } x$$

$$x_1 = \frac{769}{180} \quad y_1 = 5\sqrt{5\left(\frac{769}{180}\right)-4} = \frac{125}{6} \quad Q = \left(\frac{769}{180}, \frac{125}{6}\right) \quad \blacktriangleleft \text{Find the point of tangency.}$$

$$y - \left(\frac{125}{6}\right) = 3 \left[x - \left(\frac{769}{180}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = 3x + \frac{481}{60} \quad \text{Point of tangency: } Q = \left(\frac{769}{180}, \frac{125}{6}\right)$$

$$8. f'(x) = \frac{d}{dx} - 5\sqrt{5x-5} = \frac{(-5)(5)}{2\sqrt{5x-5}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-2 = \frac{(-5)(5)}{2\sqrt{5x-5}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{5x-5} = \frac{(-5)(5)}{2(-2)} = \frac{25}{4} \quad 5x-5 = \frac{625}{16} \quad x = \frac{141}{16} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{141}{16} \quad y_1 = -5\sqrt{5\left(\frac{141}{16}\right)-5} = \frac{-125}{4} \quad Q = \left(\frac{141}{16}, \frac{-125}{4}\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - \left(\frac{-125}{4}\right) = -2 \left[x - \left(\frac{141}{16}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = -2x + \frac{-109}{8} \quad \text{Point of tangency: } Q = \left(\frac{141}{16}, \frac{-125}{4}\right)$$

$$9. f'(x) = \frac{d}{dx} - \sqrt{5x-4} = \frac{(-1)(5)}{2\sqrt{5x-4}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-3 = \frac{(-1)(5)}{2\sqrt{5x-4}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{5x-4} = \frac{(-1)(5)}{2(-3)} = \frac{5}{6} \quad 5x-4 = \frac{25}{36} \quad x = \frac{169}{180} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{169}{180} \quad y_1 = -\sqrt{5\left(\frac{169}{180}\right)-4} = \frac{-5}{6} \quad Q = \left(\frac{169}{180}, \frac{-5}{6}\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - \left(\frac{-5}{6}\right) = -3 \left[x - \left(\frac{169}{180}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = -3x + \frac{119}{60} \quad \text{Point of tangency: } Q = \left(\frac{169}{180}, \frac{-5}{6}\right)$$

$$10. f'(x) = \frac{d}{dx} - 2\sqrt{4x-2} = \frac{(-2)(4)}{2\sqrt{4x-2}} \quad \blacktriangleleft \text{ Find the first derivative of the function.}$$

$$-1 = \frac{(-2)(4)}{2\sqrt{4x-2}} \quad \blacktriangleleft \text{ Use } m = f'(x)$$

$$\sqrt{4x-2} = \frac{(-2)(4)}{2(-1)} = 4 \quad 4x-2 = 16 \quad x = \frac{9}{2} \quad \blacktriangleleft \text{ Solve for } x$$

$$x_1 = \frac{9}{2} \quad y_1 = -2\sqrt{4\left(\frac{9}{2}\right)-2} = -8 \quad Q = \left(\frac{9}{2}, -8\right) \quad \blacktriangleleft \text{ Find the point of tangency.}$$

$$y - (-8) = -1 \left[x - \left(\frac{9}{2}\right) \right] \quad \blacktriangleleft \text{ Use the Point-Slope formula: } y - y_1 = m(x - x_1) \quad \blacktriangleright \text{ Simplify:}$$

$$\text{Equation of tangent line: } y = -x + \frac{-7}{2} \quad \text{Point of tangency: } Q = \left(\frac{9}{2}, -8\right)$$