Estimate the slope of the curve at the indicated point.

1) [Diagram of a curve with a point (-3, -2)]

Find an equation for the tangent to the curve at the given point.

2) \( y = \frac{x^3}{4}, (6, 54) \)

3) \( y = x^2 - 4, (2, 0) \)

Find the slope of the curve at the indicated point.

4) \( y = x^2 - 8x + 2, x = 1 \)

5) \( y = \frac{4}{6 + x}, x = 5 \)

Solve the problem.

6) Find the points where the graph of the function have horizontal tangents.

\[ f(x) = 2x^2 + 4x + 3 \]

7) Find equations of all tangents to the curve \( f(x) = \frac{4}{x} \) that have slope -1.

8) Find an equation of the tangent to the curve \( f(x) = 2x^2 - 2x + 1 \) that has slope 2.

9) The equation for free fall at the surface of Planet X is \( s = 8.43t^2 \) m with \( t \) in seconds. Assume a rock is dropped from the top of a 600m cliff. Find the speed of the rock at \( t = 3 \) sec.

Calculate the derivative of the function. Then find the value of the derivative as specified.

10) \( f(x) = 5x + 9; f'(2) \)

11) \( g(x) = x^3 + 5x; g'(1) \)

12) \( f(x) = \frac{8}{x}; f'(-1) \)

Find the indicated derivative.

13) \( \frac{dv}{dt} \) if \( v = t + \frac{9}{t} \)
Differentiate the function and find the slope of the tangent line at the given value of the independent variable.

14) \( s = -5t^4 - 2t^3, \ t = -1 \)

Use the formula \( f'(x) = \lim_{z \to x} \frac{f(z) - f(x)}{z - x} \) to find the derivative of the function.

15) \( f(x) = \frac{9}{x + 7} \)

16) \( f(x) = 5x^2 - 9x + 5 \)

17) \( g(x) = 4x + \sqrt{x} \)

The graph of a function is given. Choose the answer that represents the graph of its derivative.

18)

Given the graph of \( f \), find any values of \( x \) at which \( f' \) is not defined.

19)

Determine if the piecewise defined function is differentiable at the origin.

20) \( f(x) = \begin{cases} 4x - 5 & \text{if } x < 0 \\ x^2 + 5x + 5 & \text{if } x \geq 0 \end{cases} \)

Compare the right-hand and left-hand derivatives to determine whether or not the function is differentiable at the point whose coordinates are given.

21)
Answer Key

Testname: PRACTICE05

1) \(\frac{1}{2}\)

2) \(y = 27x - 108\)

3) \(y = 4x - 8\)

4) \(m = -6\)

5) \(m = -\frac{4}{121}\)

6) \((-1, 1)\)

7) \(y = -x + 4, \ y = -x - 4\)

8) \(y = 2x - 1\)

9) 50.58 m/sec

10) \(f'(x) = 5; \ f'(2) = 5\)

11) \(g'(x) = 3x^2 + 5; \ g'(1) = 8\)

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

13) \(1 - \frac{9}{12}\)

14) 14

15) \(-\frac{9}{(x + 7)^2}\)

16) \(10x - 9\)

17) \(4 + \frac{1}{2\sqrt{x}}\)

18) 

19) \(x = -2, 2\)

20) Not differentiable

21) Since \(\lim_{x \to 0^+} f'(x) = 2\) while \(\lim_{x \to 0^-} f'(x) = 1\), \(f(x)\) is not differentiable at \(x = 0\).