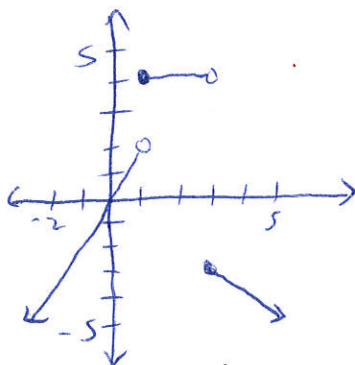


Answer Key

Math 180
Worksheet 4
Section 3.2

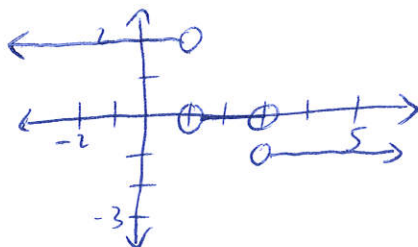
1.) Consider $f(x) = \begin{cases} 2x & x < 1 \\ 4 & 1 \leq x < 3 \\ -x & x \geq 3 \end{cases}$

a. Sketch the graph $y = f(x)$.



b. Sketch the graph $y = f'(x)$.

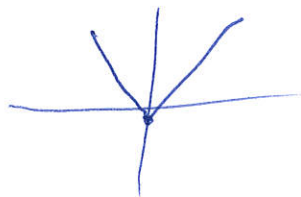
$$f'(x) = \begin{cases} 2 & x < 1 \\ 0 & 1 < x < 3 \\ -1 & x > 3 \end{cases}$$



2.) When is a function not differentiable at a point? State the various ways that this occurs and give a sketch for each way.

① The function ~~doesn't exist~~ or is not continuous at a point

② The function has a corner or cusp



3.) Find the derivative for each of the following functions. Use one of two notations to state derivatives, either $f'(x)$ format or $\frac{dy}{dx}$ format.

a. $y = 2x + 1$

$$\frac{dy}{dx} = 2$$

b. $f(x) = x^6$

$$f'(x) = 6x^5$$

c. $g(x) = 5x^{10} + \sqrt{x} = 5x^{10} + x^{1/2}$

$$g'(x) = 50x^9 + \frac{1}{2}x^{-1/2}$$

4.) Use the derivative of each of the following functions to find the equation of the tangent line at $x = 3$.

a. $f(x) = -x^2 + 4x + 8$

$$f'(x) = -2x + 4$$

$$\begin{aligned} f(3) &= -3^2 + 4 \cdot 3 + 8 \\ &= -9 + 12 + 8 \\ &= 11 \end{aligned}$$

$$\begin{aligned} f'(3) &= -2 \cdot 3 + 4 \\ &= -6 + 4 = -2 \end{aligned}$$

$$\boxed{y - 11 = -2(x - 3)}$$

b. $g(x) = \sqrt[3]{x} = x^{1/3}$

$$g'(x) = \frac{1}{3}x^{-2/3}$$

$$g(3) = 3^{1/3}$$

$$g'(3) = \frac{1}{3} 3^{-2/3} = \frac{1}{3 \cdot 3^{2/3}} = \frac{1}{3^{5/3}} = 3^{-5/3}$$

$$\boxed{y - 3^{1/3} = 3^{-5/3}(x - 3)}$$

or

$$\boxed{y - \sqrt[3]{3} = \frac{1}{3\sqrt[3]{9}}(x - 3)}$$