Name_____

Definition of the Derivative

Date_____ Period_____

Use the definition of the derivative to find the derivative of each function with respect to x.

1) $y = -2x + 5$

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

3) $y = 4x^2 + 1$

4) $f(x) = -3x^2 + 4$

5) $y = -4x^2 - 5x - 2$

6) $y = 3x^2 + 3x + 3$

7) $y = \sqrt{-3x - 5}$

8) $f(x) = \sqrt{4x - 5}$

9) $y = \dfrac{1}{x + 2}$

10) $f(x) = -\dfrac{2}{2x - 1}$

Critical thinking question:

11) Use the definition of the derivative to show that $f'(0)$ does not exist where $f(x) = |x|$.

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1) $y = -2x + 5$

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

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

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

3) $y = 4x^2 + 1$

$$\frac{dy}{dx} = 8x$$

4) $f(x) = -3x^2 + 4$

$$f'(x) = -6x$$

5) $y = -4x^2 - 5x - 2$

$$\frac{dy}{dx} = -8x - 5$$

6) $y = 3x^2 + 3x + 3$

$$\frac{dy}{dx} = 6x + 3$$

7) $y = \sqrt{-3x - 5}$

$$\frac{dy}{dx} = -\frac{3}{2\sqrt{-3x - 5}}$$

8) $f(x) = \sqrt{4x - 5}$

$$f'(x) = \frac{2}{\sqrt{4x - 5}}$$

9) $y = \dfrac{1}{x + 2}$

$$\frac{dy}{dx} = -\frac{1}{x^2 + 4x + 4}$$

10) $f(x) = -\dfrac{2}{2x - 1}$

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

Critical thinking question:

11) Use the definition of the derivative to show that $f'(0)$ does not exist where $f(x) = |x|$.

Using 0 in the definition, we have $\lim\limits_{h \to 0} \dfrac{|0 + h| - |0|}{h} = \lim\limits_{h \to 0} \dfrac{|h|}{h}$ which does not exist because the left-handed and right-handed limits are different.