

# Formal Definition of Derivative ... Practice Set 1

## Definition of the Derivative

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)  $y = \frac{1}{x+2}$

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

### Critical thinking question:

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

# Formal Definition of Derivative ... Practice Set 1

## Answers

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

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)  $y = \frac{1}{x + 2}$

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

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

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

### 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  $\lim_{h \rightarrow 0} \frac{|0+h| - |0|}{h} = \lim_{h \rightarrow 0} \frac{|h|}{h}$  which does not exist because the left-handed and right-handed limits are different.