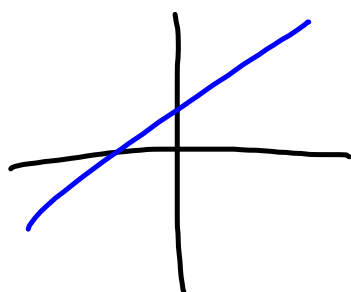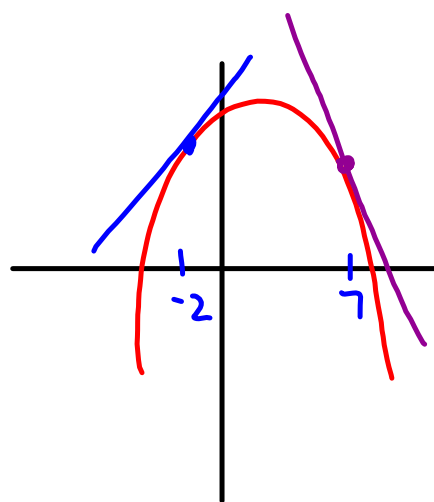# Warm-Up

$$\lim_{x \to 1} = \frac{x^2 - 1}{x - 1}$$

Lesson 11.2
The Difference Quotient

constant
rate
of
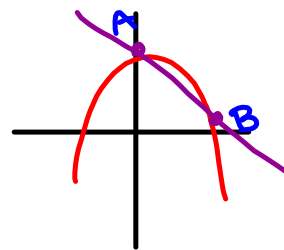change

slope at
a point

-2   7

Difference Quotient

*Intro to Calculus

$$Lim_{h \to 0} \frac{\overset{A}{f(x+h)} - \overset{B}{f(x)}}{h}$$

Use the difference quotient for the given function.

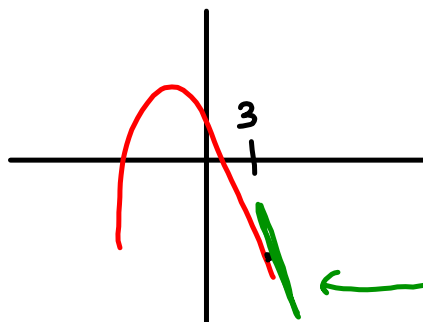$$f(x) = -3x^2 - 2x + 1$$

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x+h) = -3(x+h)^2 - 2(x+h) + 1$$

$$-3(x^2 + 2xh + h^2) - 2x - 2h + 1$$

$$\frac{-3x^2 - 6xh - 3h^2 - 2x - 2h + 1 + 3x^2 + 2x - 1}{h}$$

$$\lim_{h \to 0} \frac{h(-6x - 3h - 2)}{h} = \boxed{-6x - 2}$$

formula that finds slope at a given pt.

slope @ 3
-20

Use the difference quotient for the given function.

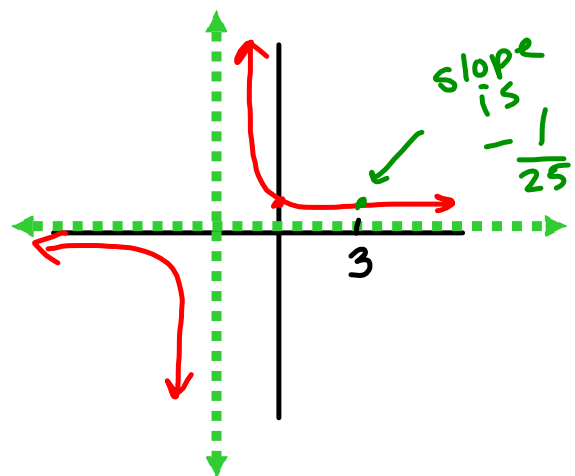$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

$$f(x+h) = \frac{1}{(x+h)+2}$$

$$\frac{\frac{1(x+2)}{x+h+2} - \frac{1(x+h+2)}{x+2}}{\frac{h}{1}} \rightarrow \frac{x+2 \; -x-h-2}{(x+h+2)(x+2)}$$

$$\lim_{h \to 0} \frac{-h}{(x+h+2)(x+2)} \cdot \frac{1}{h}$$
$$\underset{0}{\uparrow}$$

$$\frac{-1}{(x+2)^2}$$

slope
is
$-\frac{1}{25}$

3

Last type

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f(x) = \sqrt{x+7}$$

$$f(x+h) = \sqrt{x+h+7}$$

$$\frac{\left(\sqrt{x+h+7} - \sqrt{x+7} \right)}{h} \frac{\left(\sqrt{x+h+7} + \sqrt{x+7} \right)}{h \left(\sqrt{x+h+7} + \sqrt{x+7} \right)}$$

$$\lim_{h \to 0} \frac{x+h+7-x-7}{h \left(\sqrt{x+h+7} + \sqrt{x+7} \right)} = \boxed{\frac{1}{2\sqrt{x+7}}}$$

Homework: p 761: # 58-68 even, 72