

# Section 3.3

## Derivative Formulas



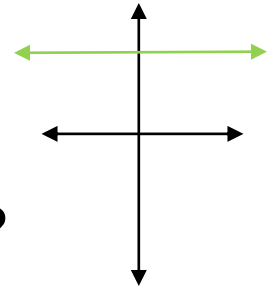
Graph  $y = 8$ .

What is the slope of any point on  $y = 8$ ?

Therefore, if  $f(x) = 8$ ,  $f'(x) = 0$ .

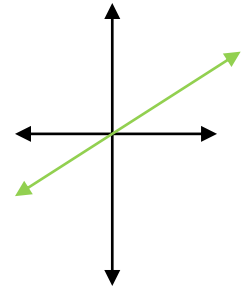
Derivative of a constant,  $c$ , is zero.

$$\frac{d}{dx}(c) = 0$$



Graph  $y = x$ .

What is the slope of any point on  $y = x$ ?



Therefore, if  $f(x) = x$ ,  $f'(x) = 1$ .

Derivative of a variable,  $x$ , is one.

$$\frac{d}{dx}(x) = 1$$

# Calculate $f'(x)$ of

Refer to your  
Ninja  
Worksheet

$$f(x) = x^2$$

$$f(x) = x^3$$

$$f(x) = x^4$$

Notice a Pattern?

Power Rule:  $\frac{d}{dx}(x^n) = nx^{n-1}$

Try:  $f(x) = x^5$ ,  $f'(x) =$

- ▶ Constant Multiple Rule:

$$\frac{d}{dx} [cf(x)] = c \frac{d}{dx} [f(x)]$$

- ▶ Example:  $f(x) = 3x^6$      $f'(x) =$

- ▶ General Rule:  $\frac{d}{dx} [cx^n] = c \cdot nx^{n-1}$

# Find each derivative

$$1. \frac{d}{dx}(x^5) =$$

$$2. \frac{d}{dx}(3x^4) =$$

$$3. \frac{d}{dx}(x^{-2}) =$$

$$4. \frac{d}{dx}(x^{3/4}) =$$

$$5. \frac{d}{dx}\left(\frac{1}{x}\right) =$$

$$6. \frac{d}{dx}\left(\frac{6}{x^3}\right) =$$

$$7. \frac{d}{dx}\left(\frac{1}{\sqrt[3]{x^2}}\right) =$$

$$8. \frac{d}{dx}(x^2\sqrt{x}) =$$

# Sum and Difference Rules:

$$\frac{d}{dx} [f(x) \pm g(x)] = \frac{d}{dx} [f(x)] \pm \frac{d}{dx} [g(x)]$$

▶ Example:

$$\frac{d}{dx} [x^8 + 12x^5 - 4x^4 + 10x^3 - 6x + 5] =$$