

### 3.2 Power Rule

Wednesday, June 12, 2019 7:14 AM

Derivative = slopes of all tangent lines to  $f(x)$   
 $f'(x)$

$$f(x) = 4x^5 - 6x^3 + 2x^2 - 8x - 5x^0$$

$$f'(x) = 20x^4 - 18x^2 + 4x - 8$$

- ① **New coefficient** → multiply exponent by current coefficient
- ② **New Exponent** → subtract one from current exponent

$$f(x) = 3x^4 + 10x^3 - 8x^2 - 12x + 3$$

$$f'(x) = 12x^3 + 30x^2 - 16x - 12$$

$\# \cdot x^{\text{power}}$

$$\# \cdot x \xrightarrow{\text{derive}} \# \quad \# \xrightarrow{\text{derive}} 0$$

(constant)

$$\sqrt[3]{x^5} \xrightarrow{\text{rewrite}} x^{5/3} \xrightarrow{\text{derive}} \frac{5}{3} x^{2/3}$$

$$\sqrt[B]{x^A} = x^{A/B}$$

$$\sqrt{x} = x^{1/2}$$

$$\frac{4}{x^3} \xrightarrow{\text{rewrite}} 4x^{-3} \xrightarrow{\text{derive}} -12x^{-4}$$

## Higher Order Derivatives:

Function:  $f(x) = 3x^4 - 6x^3 - x^2 + 10x - 5$

1<sup>ST</sup> Derivative:  $f'(x) = 12x^3 - 18x^2 - 2x + 10$

2<sup>ND</sup> Derivative:  $f''(x) = 36x^2 - 36x - 2$

3<sup>RD</sup> Derivative:  $f'''(x) = 72x - 36$

4<sup>TH</sup> Derivative:  $f^{(4)}(x) = 72$

5<sup>TH</sup> Derivative:  $f^{(5)}(x) = 0$