

# Basic Derivative Rules

## 2.1 – Power Rule

Leibniz's Notation

**Power Rule**

$$\frac{d}{dx}x^n = n \cdot x^{n-1}$$

**Derivative of a Constant**

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

**A Special Application of the Power Rule**

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

**Constant Multiple Rule**

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

**Sum-Difference Rule**

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

**Evaluating**

$$\left. \frac{df}{dx} \right|_{x=2}$$

Evaluate  $g(t)$  at 4

Evaluate  $w^3$  at 1

Evaluate  $f(x)$  at 0

Newton's Notation

**Power Rule**

$$\text{If } f(x) = x^n, \text{ then } f'(x) = n \cdot x^{n-1}$$

**Derivative of a Constant**

$$\text{If } f(x) = c, \text{ then } f'(x) = 0.$$

**A Special Application of the Power Rule**

$$\text{If } f(x) = x, \text{ then } f'(x) = 1$$

**Constant Multiple Rule**

$$[c \cdot f(x)]' = c \cdot f'(x)$$

**Sum-Difference Rule**

$$[f(x) \pm g(x)]' = f'(x) \pm g'(x)$$

**Evaluating**

$$f'(2)$$

Evaluate  $g(t)$  at 4

Evaluate  $w^3$  at 1

Evaluate  $f(x)$  at 0

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A: The Power Rule

#1)  $\frac{d}{dx} x^{10}$

#2)  $\frac{dx^{50}}{dx}$

#3) If  $y = x^{-8/3}$ , find  $y'$

#4) If  $y = 8\sqrt{x}$ , find  $y'$

#5)  $\frac{d}{dx} \left( \frac{x^2}{6} \right)$

#6)  $\frac{d}{dx} 90,000,000,000$

#7)  $\frac{d}{dx} \left( \frac{6}{x^9} \right)$

#8) If  $y = \sqrt[3]{x}$ , find  $y'$

#9) If  $y = 6x$ , find  $y'$

#10)  $\frac{d}{dx} \left( x^3 - \frac{5}{2}x^2 + 4x - 6 \right)$

#11) If  $y = 5x^{-7} + 9x^{-3} - 9$ , find  $y'$

#12) If  $f(x) = 0$ , find  $f'(x)$

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Ex B: Evaluating a Derivative

#1) If  $h(x) = 6\sqrt{x}$ , find  $h'(8)$ .

$$\#4) \frac{d}{dw} \left( \frac{8}{\sqrt[4]{w}} - \frac{5}{\sqrt{w}} \right) \Big|_{w=81}$$

#2) If  $f(r) = \frac{4}{3}\pi r^3$ , find  $\frac{df}{dr} \Big|_{r=4}$

$$\#5) \frac{d}{dt} \left( \frac{t^4+t^5}{t+1} \right) \Big|_{t=10}$$

#3) If  $f(x) = ex^6 - x^e$ , find  $f'(5)$

$$\#6) \text{ Find } v'(1) \text{ if } v(t) = \sqrt[6]{t^7} - \frac{5}{\sqrt[7]{t^5}}$$

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C: Find each equation in slope-intercept form.

#1) Find the equation of the tangent line to the function  $f(x) = 3x^2 - x + 8$  at  $x = -5$

