

Differentiation Rules

Constant Rule:

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

Constant times a function rule:

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

General Power Rule:

$$\frac{d}{dx}[x^k] = k \cdot x^{k-1}$$

The Extended Power Rule:

$$\frac{d}{dx}[g(x)]^k = k[g(x)]^{k-1} \cdot \frac{d}{dx}g(x)$$

The Sum-Difference Rule:

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

The Product Rule:

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

The Quotient Rule:

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{\frac{d}{dx}f(x) \cdot g(x) - f(x) \cdot \frac{d}{dx}g(x)}{[g(x)]^2}$$

The Chain Rule:

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