Derivative Techniques

Linearity

$$\frac{d}{dx}\left[af(x) + bg(x)\right] = a \cdot \frac{d}{dx}f(x) + b \cdot \frac{d}{dx}g(x)$$

Product Rule

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

Quotient Rule

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

Power Rule

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

Extended Power Rule

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

Chain Rule

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