

# Basic Rules of Derivation

Let  $A$  and  $B$  be functions of  $x$ , and let  $n$ ,  $m$ , and  $k$  be arbitrary constants.

Fundamental Derivation:       $y = kx^n$        $\frac{dy}{dx} = nkx^{n-1}$

Addition Rule:       $y = A + B$        $\frac{dy}{dx} = \frac{dA}{dx} + \frac{dB}{dx}$

Example:       $y = x^n + x^m$        $\frac{dy}{dx} = nx^{n-1} + mx^{m-1}$

Multiplication Rule:       $y = AB$        $y = A \frac{dB}{dx} + B \frac{dA}{dx}$

Example:       $y = x^n x^m$        $\frac{dy}{dx} = x^n (mx^{m-1}) + x^m (nx^{n-1})$

Division Rule:       $y = \frac{A}{B}$        $y = \frac{B \frac{dA}{dx} - A \frac{dB}{dx}}{B^2}$

Example:       $y = \frac{x^n}{x^m}$        $\frac{dy}{dx} = \frac{x^m (nx^{n-1}) - x^n (mx^{m-1})}{(x^m)^2}$

Nested Functions Rule:       $y = A$        $\frac{dy}{dx} = \frac{dy}{dA} \frac{dA}{dx}$

Example:       $y = (x^m)^n$        $\frac{dy}{dx} = n(x^m)^{n-1} (mx^{m-1})$

Special cases:

Exponential function       $y = e^x$        $\frac{dy}{dx} = e^x$

Natural log function       $y = \ln x$        $\frac{dy}{dx} = \frac{1}{x}$