

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