

# Calculus I: Derivative Rules (Differentiation) Formula Sheet

*Core Calc I rules*

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## 1) Basic Facts & Notation

- **Derivative (definition):**

$$f'(x) = \lim_{h \rightarrow 0} \frac{\text{_____}}{\text{_____}}$$

- **Leibniz notation:**  $f'(x) = \text{_____}$  when  $y = f(x)$ .
- **Higher derivatives:**  $f''(x), \text{_____}, \dots, f^{(n)}(x)$ .

## 2) Core Differentiation Rules (Calc I Essentials)

Let  $u = u(x)$ ,  $v = v(x)$ ,  $c$  constant.

Rule	Formula (fill in)
Constant Rule	$\frac{d}{dx}[c] = \text{_____}$
Power Rule	$\frac{d}{dx}[x^n] = \text{_____}$
Constant Multiple	$\frac{d}{dx}[c u] = \text{_____}$
Sum/Difference	$\frac{d}{dx}[u \pm v] = \text{_____}$
Product Rule	$\frac{d}{dx}[uv] = \text{_____}$
Quotient Rule	$\frac{d}{dx}\left[\frac{u}{v}\right] = \text{_____}$
Chain Rule	$\frac{d}{dx}[f(g(x))] = \text{_____}$

## 3) Common Derivatives (Core Table)

### A) Algebraic / Root Forms

$$\frac{d}{dx}[x^n] = \text{_____}, \quad \frac{d}{dx}[\sqrt{x}] = \text{_____}, \quad \frac{d}{dx}\left[\frac{1}{x}\right] = \text{_____}$$

## B) Exponential & Logarithmic

Function	Derivative (fill in)
$e^x$	_____
$a^x$ ( $a > 0, a \neq 1$ )	_____
$\ln(x)$	_____
$\log_a(x)$	_____
$\ln u $	_____
$e^u$	_____
$a^u$	_____

## C) Trigonometric

Function	Derivative (fill in)
$\sin x$	_____
$\cos x$	_____
$\tan x$	_____
$\cot x$	_____
$\sec x$	_____
$\csc x$	_____