

Calculus I: Derivative Rules (Differentiation) Formula Sheet

Core Calc I rules

1) Basic Facts & Notation

- **Derivative (definition):**

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

- **Leibniz notation:** $f'(x) = \frac{dy}{dx}$ when $y = f(x)$.
- **Higher derivatives:** $f''(x)$, $f'''(x)$, \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	$\frac{d}{dx}[c] = \underline{\hspace{2cm}}$
Power Rule	$\frac{d}{dx}[x^n] = \underline{\hspace{2cm}}$
Constant Multiple	$\frac{d}{dx}[cu] = \underline{\hspace{2cm}}$
Sum/Difference	$\frac{d}{dx}[u \pm v] = \underline{\hspace{2cm}}$
Product Rule	$\frac{d}{dx}[uv] = \underline{\hspace{2cm}}$
Quotient Rule	$\frac{d}{dx}\left[\frac{u}{v}\right] = \underline{\hspace{2cm}}$
Chain Rule	$\frac{d}{dx}[f(g(x))] = \underline{\hspace{2cm}}$

3) Common Derivatives (Core Table)

A) Algebraic / Root Forms

$$\frac{d}{dx}[x^n] = \underline{\hspace{2cm}}, \quad \frac{d}{dx}[\sqrt{x}] = \underline{\hspace{2cm}}, \quad \frac{d}{dx}\left[\frac{1}{x}\right] = \underline{\hspace{2cm}}$$

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)
$\sin x$	_____
$\cos x$	_____
$\tan x$	_____
$\cot x$	_____
$\sec x$	_____
$\csc x$	_____