

# Derivatives Cheat Sheet

## Derivative Rules

1. Constant Rule:  $\frac{d}{dx}(c) = 0$ , where  $c$  is a constant
2. Power Rule:  $\frac{d}{dx}(x^n) = nx^{n-1}$
3. Product Rule:  $(fg)' = f'g + fg'$
4. Quotient Rule:  $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$
5. Chain Rule:  $(f(g(x)))' = f'(g(x))g'(x)$

## Exponential & Logarithmic Functions

$$\begin{aligned}\frac{d}{dx}(a^x) &= a^x \ln(a) & \frac{d}{dx}(e^x) &= e^x \\ \frac{d}{dx}(\log_a(x)) &= \frac{1}{x \ln(a)} & \frac{d}{dx}(\ln(x)) &= \frac{1}{x}\end{aligned}$$

## Chain Rule

These rules are all generalizations of the above rules using the chain rule.

1.  $\frac{d}{dx}([g(x)]^n) = n[g(x)]^{n-1}g'(x)$
2.  $\frac{d}{dx}(a^{g(x)}) = a^{g(x)}g'(x)\ln(a)$
3.  $\frac{d}{dx}(e^{g(x)}) = e^{g(x)}g'(x)$
4.  $\frac{d}{dx}(\log_a |g(x)|) = \frac{1}{g(x)\ln(a)}g'(x)$
5.  $\frac{d}{dx}(\ln |g(x)|) = \frac{1}{g(x)}g'(x)$