Core Derivative Rules Summary

If c is a real constant, and $u = f(x)$, $v = g(x)$ are real functions, then:

$$u' = \frac{d}{dx}u, \qquad u'' = \frac{d^2}{dx^2}u, \qquad u^{(n)} = \frac{d^n}{dx^n}u$$

$$(u \pm v)' = u' \pm v'$$

$$(cu)' = (c)u'$$

$$(uv)' = u'v + v'u$$

$$\left(\frac{u}{v}\right)' = \frac{u'v - v'u}{v^2}$$

$$\big(f(g(x))\big)' = f'(g(x))\,g'(x)$$

$$OR \quad \frac{d}{dx}f(u) = \frac{df(u)}{du}\frac{du}{dx}$$

$$(c)' = 0 \qquad \left(x^n\right)' = nx^{n-1}$$

$$\left(e^x\right)' = e^x \qquad \left(a^x\right)' = a^x \ln a$$

$$\left(\ln x\right)' = \frac{1}{x} \qquad \left(\log_a x\right)' = \frac{1}{x \ln a}$$

$$\left(\sin x\right)' = \cos x \qquad \left(\cos x\right)' = -\sin x$$

$$\left(\tan x\right)' = \sec^2 x = \frac{1}{\cos^2 x}$$

$$\frac{d}{dx}\ln(f(x)) = \frac{f'(x)}{f(x)} \qquad \frac{d}{dx}\left(f(x)\right)^n = n\left(f(x)\right)^{n-1} f'(x)$$

$$\frac{d}{dx}e^{f(x)} = e^{f(x)} f'(x)$$