

CHAIN RULE

$$(f \circ g)'(x) = f'(g(x)) \cdot g'(x)$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

CONSTANT MULTIPLIER

$$\frac{d}{dx}(cu) = c \frac{du}{dx}$$

POWER FUNCTION

$$\frac{d}{dx} u^n = nu^{n-1} \frac{du}{dx}$$

PRODUCT

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \text{ or } u'v + uv'$$

QUOTIENT

$$\frac{d}{dx} \left(\frac{u}{v} \right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \text{ or } \frac{u'v - uv'}{v^2}$$

TRIG FUNCTIONS

$$\frac{d}{dx} \sin u = \cos u \frac{du}{dx}$$

$$\frac{d}{dx} \cos u = -\sin u \frac{du}{dx}$$

$$\frac{d}{dx} \tan u = \sec^2 u \frac{du}{dx}$$

$$\frac{d}{dx} \cot u = -\csc^2 u \frac{du}{dx}$$

$$\frac{d}{dx} \sec u = \sec u \tan u \frac{du}{dx}$$

$$\frac{d}{dx} \csc u = -\csc u \cot u \frac{du}{dx}$$

EXPONENTIAL FUNCTIONS

$$\frac{d}{dx} e^u = e^u \frac{du}{dx} \quad \frac{d}{dx} a^u = a^u \ln a \frac{du}{dx}$$

LOGARITHMIC FUNCTIONS

$$\frac{d}{dx} \ln u = \frac{1}{u} \frac{du}{dx}$$

$$\frac{d}{dx} \log_a u = \frac{1}{u \ln a} \frac{du}{dx}$$

INVERSE TRIG FUNCTIONS

$$\frac{d}{dx} \sin^{-1} u = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}, \quad |u| < 1$$

$$\frac{d}{dx} \cos^{-1} u = -\frac{d}{dx} \sin^{-1} u$$

$$\frac{d}{dx} \tan^{-1} u = \frac{1}{1+u^2} \frac{du}{dx}$$

$$\frac{d}{dx} \cot^{-1} u = -\frac{d}{dx} \tan^{-1} u$$

$$\frac{d}{dx} \sec^{-1} u = \frac{1}{|u|\sqrt{u^2-1}} \frac{du}{dx}, \quad |u| > 1$$