

Derivatives of Logarithmic Functions:

$$\frac{d}{dx}(\log_a x) = \frac{1}{x \cdot \ln a}$$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dx}(\log_a u(x)) = \frac{u'(x)}{u(x) \cdot \ln a}$$

$$\frac{d}{dx}(\ln u(x)) = \frac{u'(x)}{u(x)}$$

Example: Differentiate

$$y = \ln(x^3 + 1)$$

Solution:**Example:** Find

$$\frac{d}{dx} \ln(\sin x)$$

Solution:

$$\frac{d}{dx} \ln(\sin x) =$$

Example: Differentiate

$$f(x) = \sqrt{\ln x}$$

Solution:**Example:** Differentiate

$$f(x) = \log_{10}(2 + \sin x)$$

Solution:

Example: Find

$$\frac{d}{dx} \ln \left(\frac{x+1}{\sqrt{x-2}} \right)$$

Solution:

$$\frac{d}{dx} \ln \left(\frac{x+1}{\sqrt{x-2}} \right) =$$

Example: Find $f'(x)$ if

$$f(x) = \ln|x|$$

Solution:

Example: Differentiate

$$y = \frac{x^{\frac{3}{4}} \sqrt{x^2 + 1}}{(3x + 2)^5}$$

Solution:

Example: Differentiate

$$y = x^{\sqrt{x}}$$

Solution:

Example: Differentiate

$$y = x^{\cos x}$$

Solution: