

3.9 Logarithmic/Exponential Derivatives

Objectives:

- I can find the derivative of an exponential function
- I can find the derivative of a logarithmic function

What is the derivative of $y = e^x$

Analytically:

Graphically:

Numerically:

Rule Sheet

58. $\frac{d}{dx}(e^x) = e^x$

59. $\frac{d}{dx}(a^x) = a^x \ln a$

Find the derivative of $y = \ln x$

Rule Sheet

$$56. \frac{d}{dx}(\ln x) = \frac{1}{x}, x > 0$$

$$57. \frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}, x > 0$$

Find the derivative. State any domain restrictions.

$$f(x) = 2e^{2x}$$

$$y = e^{-\frac{x}{2}}$$

$$g(x) = 3^{4x}$$

$$y = xe^{2x}$$

Find the derivative. State any domain restrictions.

$$y = 4^{x^2}$$

$$g(x) = \ln\left(\frac{1}{x}\right)$$

Find the derivative. State any domain restrictions.

$$y = \frac{e^x}{\ln x}$$

$$y = x \ln x$$

$$y = \ln(x^2)$$

$$y = \log_6(x^3 + 2x - 1)$$

$$y = e^{2 \ln 6}$$

$$f(x) = \ln 2^x$$

3.9

Find the derivative. State any domain restrictions.

$$y = \log_6 \sqrt[3]{x}$$

$$y = \ln(\cos x)$$

Find the equation of the line tangent to $y = 2e^x$
at $x=1$

$$y = \ln(\ln x)$$

$$y = e^{\tan^2 x}$$

$$f(x) = \sec^{-1}(e^x)$$

Find the equation of the line tangent to $y = x^2$
at $x=e$