Differentiation of Exponential and Logarithmic Functions

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

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

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

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

Ex 1.

Differentiate:

$f(x) = x^3 e^x$

$f(x) = e^{x^2+1}$

$f(x) = \frac{\ln x^3}{x}$

$f(x) = \ln \sqrt{2x^2 + 1}$

$f(x) = 3^{5x+2}$

_____ is a technique to help differentiate functions with many products, quotients, and powers.

Ex 2.

Use logarithmic differentiation to find the derivative of the following function.

$f(x) = \dfrac{\sqrt[4]{x+2}}{(1-2x)^3}$

Practice

1. Differentiate:

$f(x) = \dfrac{e^{5x}}{x+1}$

$f(x) = x \ln \sqrt{x^2 - 3}$

$f(x) = \log_3(5x)$

2. Use logarithmic differentiation to find the derivative of the following function.

$f(x) = x^2 e^{-3x} (2x + 5)^5$

Q: What has four wheels and flies?