



NATURAL EXPONENTIAL AND LOGARITHMIC FUNCTION

DIFFERENTIAL CALCULUS

prepared by:

Gyro A. Madrona

Electronics Engineer

TOPIC OUTLINE

Derivative of Natural Exponential Function

Derivative of Natural Logarithmic Function



DERIVATIVE OF NATURAL EXPONENTIAL FUNCTION



NATURAL EXPONENTIAL FUNCTION

Derivative of e^x

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

The natural exponential function is a function of the form

$$y = e^x$$

where

$e \approx 2.71828$ is the Euler's number

Chain Rule

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



EXERCISE

Differentiate $y = e^{3x}$.

Differentiate $y = e^{x^2}$.



EXERCISE

Differentiate $f(x) = (x^3 + 2x)e^x$.

Differentiate $y = \frac{e^x}{1-e^x}$.



EXERCISE

Differentiate $y = e^{\tan x}$.

Find y' if $y = e^{-4x} \sin 5x$.



DERIVATIVE OF NATURAL LOGARITHMIC FUNCTIONS

NATURAL LOGARITHMIC FUNCTION

Derivative of $\ln x$

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

The natural logarithmic function is a function of the form

$$y = \ln(x)$$

where

Chain Rule

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

$\ln x$ is the natural logarithm ($\log_e x = \ln x$)



EXERCISE

Differentiate $y = \ln(3x)$.

Find y' if $y = \ln(x^2)$.



EXERCISE

Differentiate $y = \ln(x + 1)$.

Find y' if $y = \ln(\sqrt{x})$.



EXERCISE

Differentiate $y = \ln(\sin x)$.

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



EXERCISE

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

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



LABORATORY