Section 3.6 ***Derivative of Logarithms and Inverse Trig. Functions***

Given $y = e^x \Rightarrow \frac{dy}{dx} = e^x$. Use implicit differentiation to differentiate $y = \ln(x)$

1. General rule for derivative of logarithmic functions:

2. General rule for derivative of exponential functions:

3. Rules for logarithm:

Ex: Differentiate the following functions:

a) $$y = \ln\left(\frac{x^3 + 2x - 3}{\sqrt{2x+5}}\right)$$

b) $$y = \ln\left[\sqrt[5]{\frac{e^{3x^2-5}\sin^3(3x+4)}{\tan^4(5x^2+3)(x^3+1)^2}}\right]$$

c) $y = \log_4 \left[\dfrac{7^{3x^2+1}(2x-3)^3}{\sqrt{\sin(2x+5)}\,(x^4+2)^4} \right]$

How to differentiate complex functions and function in the form of $y = [u(x)]^{v(x)}$ ➔Take log both sides.

Ex: Differentiate the following functions:

a) $y = \dfrac{e^{\sin(3x+2)}\sqrt{7x^4-5}}{\cos^3(2x-1)(3x^2+4)^5}$

b) $y = \left[7x^3 - 5x^2 + 2\right]^{\sin(3x+1)}$

Derivative of Inverse Trig. Functions:

Ex: Differentiate the following functions:

a) $y = \sin^{-1}\left(\sqrt{3x^2+1}\right)$

b) $y = e^{\cos^{-1}\left(x^2+1\right)} \tan^{-1}\left(7x^2-2\right)$

c) $y = \cos^{-1}\left(\frac{x^3+1}{x^2+5x-7}\right)$

d) $y = x\sqrt{1-x^2} + \cos^{-1} x$ (Simplify this)