Exponential and Logarithmic Functions

DIFFERENTIATION

'e'

e is a **transcendental number** like π and is equal to approx. 2.718281828

Differentiating exponentials with 'e'

e is unique in that:

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

Also, the function of a function rule:

$$y = e^{f(x)}, then \frac{dy}{dx} = f'(x)e^{f(x)}$$

Logarithms

This is another name for the index or power of a number

Definition: $\boldsymbol{y = a^x,\ then\ x = log_a y}$

Differentiation of Logarithms

$$y = \log_e x,\ \ then \frac{dy}{dx} = \frac{1}{x}$$

Function of a function rule:

$$y = \log_e f(x),\ \ then \frac{dy}{dx} = f'(x) * \frac{1}{f(x)} = \frac{f'(x)}{f(x)}$$

Logarithm Laws/Special Values

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

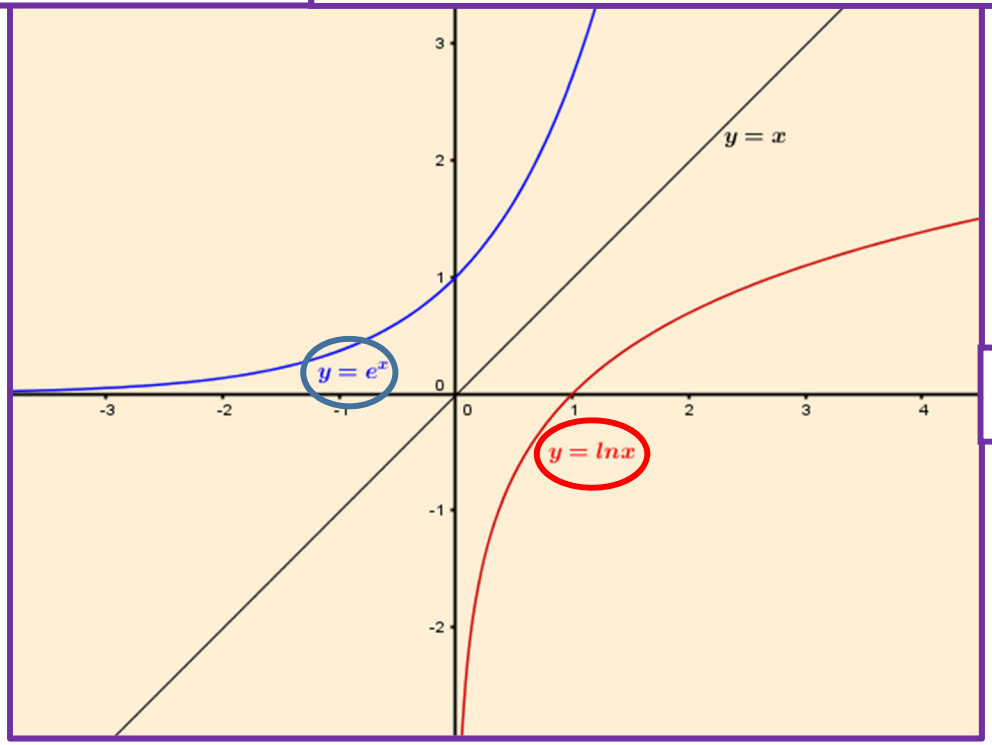
$$\log_a x^n = nlog_a x$$

$$\log_a a = 1$$

$$\log_a 1 = 0$$

Change of Base formula

$$\log_a x = \frac{\log_b x}{\log_b a}$$



Notice that the two graphs mirror each other along the line y=x