Mohammed KA Kaabar Derivative (Part II) Feb. 12th, 2016

* Vertical and Horizontal Asymptotes:

Ex1 Find the vertical and horizontal asymptotes for the following functions:

Part a: $y = \frac{2x-3}{x-5}$

Part b: $y = \frac{1}{x}$

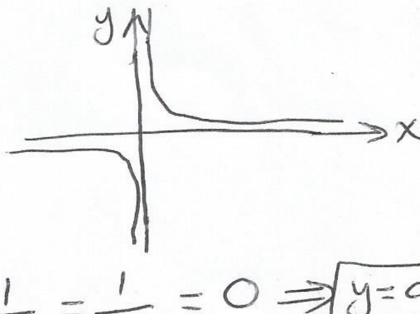
Solution:

a. To find the vertical asymptote, we set the denominator to be equal to zero as follows:

$x - 5 = 0 \Rightarrow \boxed{x = 5}$ ⇐ This is the vertical asymptote for $y = \frac{2x-3}{x-5}$. Now, to find the horizontal asymptote, we find the limit of $\frac{2x-3}{x-5}$ as $x \to \pm\infty$ as follows:

$$\lim_{x \to \pm\infty} \frac{2x-3}{x-5}$$ leading terms

$$= \lim_{x \to \pm\infty} \frac{2\cancel{x}}{\cancel{x}} = 2 \Rightarrow \text{So, } \boxed{y = 2}$$ ⇐ This is the horizontal asymptote for $\frac{2x-3}{x-5}$.



b. Vertical Asymptote: $\boxed{x = 0}$

Horizontal Asymptote: $y = \lim_{x \to \pm\infty} \frac{1}{x} = \frac{1}{\pm\infty} = 0 \Rightarrow \boxed{y = 0}$

* General Rules for Differentiation:

$$\boxed{(a^x)' = a^x \ln a}$$

$$\boxed{(\log_a x)' = \frac{1}{x \ln a}}$$

Ex2| Find y' for the following functions:

a: $y = \ln(x^3 + 2x)$

b: $y = \ln(\tan x)$

c: $y = \ln(\sin x^2)$

d: $y = e^{\tan x}$

e: $y = \log_3 x$

Solution:

ⓐ $y' = \frac{1}{(x^3+2x)} \cdot (3x^2+2) = \frac{3x^2+2}{x^3+2x}$.

ⓑ $y' = \frac{1}{\tan x} \cdot (\sec^2 x) = \frac{\sec^2 x}{\tan x}$.

ⓒ $y' = \frac{1}{\sin x^2} \cdot ((\cos x^2) \cdot 2x) = \frac{2x \cos x^2}{\sin x^2}$.

ⓓ $y' = e^{\tan x} \cdot \sec^2 x = (\sec^2 x) e^{\tan x}$.

ⓔ $y' = \frac{1}{x \ln 3}$.