

# TANGENTS ASSIGNMENT

Q1.  $y = 2 \tan(3x + 180^\circ) + 3$   
 $= 3 - 2 \frac{\sin(3x + 180^\circ)}{\cos(3x + 180^\circ)}$

$$\cos(3x + 180^\circ) = 0$$

$$x = 30^\circ + 60^\circ n$$

$$\underline{\text{Domain}} = \{x \mid 60^\circ n \leq x \leq 30^\circ + 60^\circ n\}$$

$$\underline{\text{Range}} = \{y \mid -\infty < y < \infty, y \in \mathbb{R}\}$$

$$\underline{\text{Period}} = \frac{180^\circ}{3}$$
$$= 60^\circ$$

$$\underline{\text{vertical asymptotes}} \Rightarrow x = 30^\circ + 60^\circ n$$

Zeros  $y = -2 \tan(3x + 180^\circ) + 3 = 0$   
 $\Rightarrow \tan(3x + 180^\circ) = +\frac{3}{2}$

$$3x + 180 = \tan^{-1}\left(\frac{3}{2}\right) + 180n$$

$$3x = \tan^{-1}\left(\frac{3}{2}\right) + 180n - 180$$

$$x = \frac{1}{3} \tan^{-1}\left(\frac{3}{2}\right) + 60n - 60$$

Vertical asymptotes

$$x = \frac{115\pi - 360}{6} + \frac{\pi}{3}n.$$

y-intercepts

putting  $n = 0$

$$\begin{aligned} y &= -2 \tan(180^\circ) + 3 \\ &= 3 \end{aligned}$$

$\therefore$  y intercepts  $\therefore (0, 3)$ .

Q2. Given equation

$$y = 3 \tan 2x$$

To shift left by 60 units

$$y = 3 \tan 2(x + 60)$$

To shift down by 5 units.

$$y = 3 \tan 2(x + 60) - 5.$$

New equation

$$y = 3 \tan [2(x + 60^\circ)] - 5.$$

Q3. Let us take

$$y = \tan(x)$$

$$y - 3 = -\tan x (-2x + 180^\circ)$$

$$y_2 = -\tan(-2x + 180^\circ) + 3$$

$$y_2 = -\tan 2(x - 90^\circ) + 3$$

Difference b/w the graphs is of transformation of  $y_1$  to  $y_2$  which can be explained as follows:

$$\begin{aligned} \textcircled{1} \text{ Phase shift} &= \frac{-180}{-2} \\ &= 90^\circ \end{aligned}$$

$$\textcircled{2} \text{ Vertical shift} = 3 \text{ units up}$$

$\textcircled{3}$  Reflection on the  $x$ -axis.