RBT

Another Approach to determine Period & Phase Shift

Example: $y = 3\sin(4x - \pi) + 1$

The sine function has a fundamental period $= 2\pi$

★ Set the entire "angle" $= 2\pi$, where sine ends a cycle.

$$4x - \pi = 2\pi$$

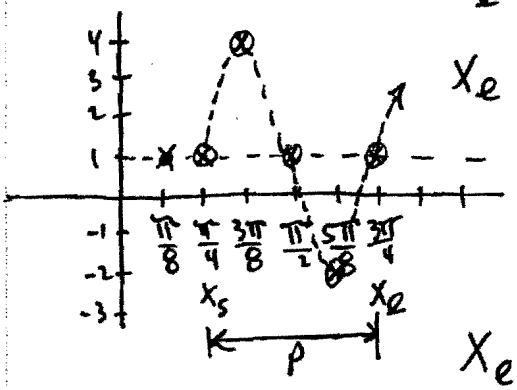
★ Solve for x, the value where the problem ends a cycle.

$$4x_e - \pi = 2\pi$$

$$4x_e = 2\pi + \pi$$

↖ here is the end point of a cycle.

$$x_e = \frac{\pi}{2} + \frac{\pi}{4} = \frac{3\pi}{4}$$



↑ here is the period

↖ here is the phase shift (start point of a cycle)

$$x_e = p + x_s$$

$$\frac{1}{4}p = \frac{1}{4}\left(\frac{\pi}{2}\right) = \frac{\pi}{8}$$

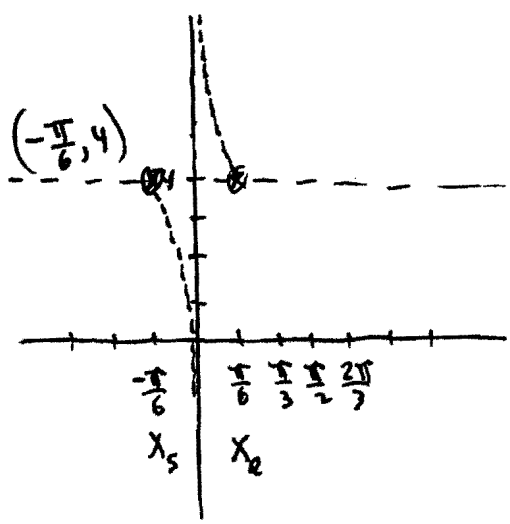
Example: $y = -2\tan\left(3x + \frac{\pi}{2}\right) + 4$

whole angle → $3x + \frac{\pi}{2} = \pi$ ← Period of tangent fcn.

$$3x = \pi - \frac{\pi}{2}$$

$$x_e = \frac{\pi}{3} - \frac{\pi}{6} = \frac{\pi}{6}$$

$$x_e = p + x_s$$



for tangent

$$\frac{1}{2}p = \frac{1}{2}\left(\frac{\pi}{3}\right) = \frac{\pi}{6}$$

37/354 Sec. 6.5

$$y = 3\sin\left(4x - \pi\right) + 1$$

$$\frac{y-1}{3} = \sin\left(\frac{x - \frac{\pi}{4}}{\frac{1}{4}}\right) \Leftarrow \text{transform form}$$

Amplitude $= 3(1) = 3$

Period $= \frac{1}{4}(2\pi) = \frac{\pi}{2}$ $\quad \therefore \frac{1}{4}T = \frac{1}{4}\left(\frac{\pi}{2}\right) = \frac{\pi}{8}$

phase shift $= \frac{\pi}{4}$

node line $\Rightarrow y = 1$ (vert. shift)

use phase shift & T or $\frac{1}{4}T$ to set scale "tic marks"

$\frac{1}{4}T = \frac{\pi}{8}$ $\quad s = \frac{\pi}{4} = 2\left(\frac{\pi}{8}\right)$

$\therefore$ use $\frac{\pi}{8}$ for scale

To sketch:

1. set axes with scaling
2. Use phase shift + vertical shift to set starting point of cycle.
3. Set crest, other nodes, and troughs using $\frac{1}{4}$ cycle increments.
4. Carefully add lines to complete a single cycle sketch.
5. Add other points if you wish & identify from the sketch another equation that represents the same graph. ($y = -3\sin 4x + 1$)