

Aim: How do we graph horizontal translations (phase shifts) of sine and cosine curves?

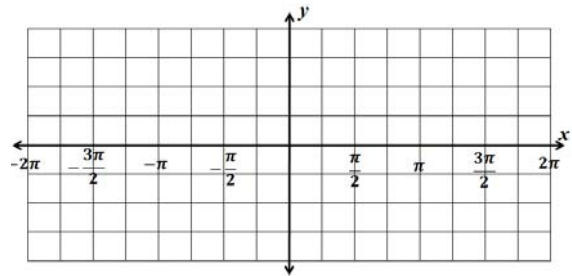
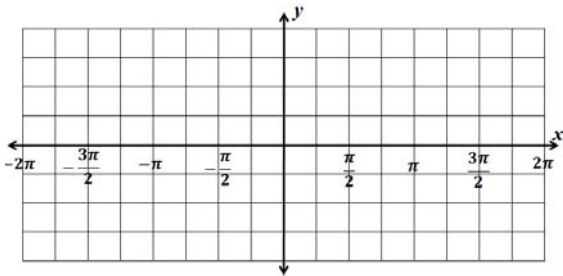
I. Do Now:

1. Describe each transformation of the graph of $y = f(x)$:

- (a) $y = f(x + 3)$ (b) $y = f(x - 2)$ (c) $y = f(x) + 1$ (d) $y = f(x - 4) - 5$

2. Use your graphing calculator to sketch each graph:

- (a) $y = \cos(x + \pi)$ (b) $y = \sin(2x - \pi)$



Solve each pair of equations for x . (Leave answers in terms of π .)

- (c) $x + \pi = 0$ and $x + \pi = 2\pi$ (d) $2x - \pi = 0$ and $2x - \pi = 2\pi$

(e) What is the significance of the answers you found in #3?

II. Horizontal Translations (Phase Shifts) of Sine and Cosine Curves

Graphs of equations of the form

$y = a \sin(bx - c) + d$ or $y = a \cos(bx - c) + d$

have the following characteristics. (Assume $b > 0$.)

Amplitude =

Frequency =

Period =

Vertical Shift =

Phase Shift =

On your calculator, graph $y = \cos(x - \frac{\pi}{2})$.

What do you notice?

The graph of $y = \cos(x - \frac{\pi}{2})$ is _____

Any cosine function can be expressed using _____

III. Determine an appropriate scale and then sketch two cycles of the graph of each equation.

3. $y = 2 \sin(x - \frac{\pi}{6})$



4. $y = -4 \cos(x + \frac{\pi}{4}) + 1$



5. $y = 5 \cos(2\pi x + 4\pi) - 2$



6. $y = 1 - 3 \sin(\frac{2}{3}x - \frac{\pi}{3})$



7. Write equations of the following graph using both sine and cosine.

