$$y = A \sin B (x + C) + D$$

Name: Key

Precalculus

5.4 - Graphing Sin and Cos

Phase Shift

$$y = A \sin B (x + \mathbf{C}) + D$$

π

"C" represents the amount of phase shift the graph undergoes.
Be careful.....a positive phase shift moves the graph to the left!
It is often helpful to graph the unshifted function first, then use it to determine the final graph by sliding it over by the amount of the the phase shift opposite the direction of the given sign.
You can use a pencil to graph the unshifted function first, and then erase it after you draw the final graph . . . or use a dotted line for the first one and a solid line for the final answer . . . or use two different colors. Just be sure to indicate which is your final answer!

Sometimes the function has not been written in standard form, so it is helpful to know how to rewrite it that way.

$y = 3\sin(2x + \pi)$

You always need to factor out the coefficient of the x, so

$(2x + \pi) = 2(x + \frac{\pi}{2})$, so the standard-form version would be

$y = 3\sin 2(x + \frac{\pi}{2})$

This version also makes it easier to determine B, and therefore, the period of the function.

Amplitude = 3, period = π, and phase shift is $\frac{\pi}{2}$ to the left.

Practice changing into standard form.

1) $y = 2\sin(3x - \pi)$

$y = 2\sin 3(x - \pi/3)$

2) $y = 3\cos(2x - \frac{\pi}{4})$

$y = 3\cos 2(x - \pi/8)$

3) $y = -\sin(4x + \frac{\pi}{3})$

$y = -\sin 4(x + \pi/12)$

4) $y = \sin(\frac{3x}{5} + \pi)$

$y = \sin\frac{3}{5}(x + \frac{5\pi}{3})$

5) $y = \cos(\frac{x}{2} - \frac{\pi}{3})$

$y = \cos\frac{1}{2}(x - \frac{2\pi}{3})$

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

$y = \sin 6(x + \frac{\pi}{18})$

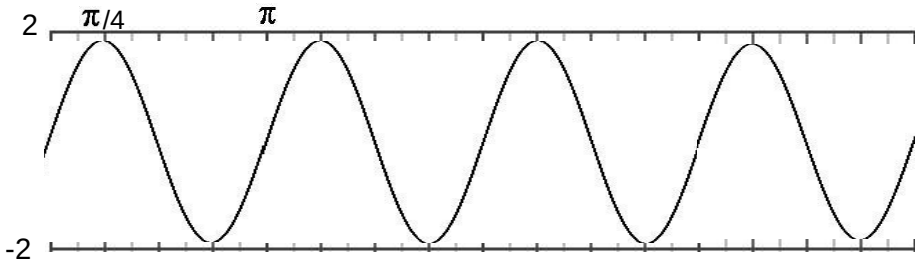
π

Graph these functions across the entire given coordinate plane.

7) function: sin(x), amplitude = 2, period = 2π, phase shift: $\frac{\pi}{4}$ to the right.

Write this function in standard form:

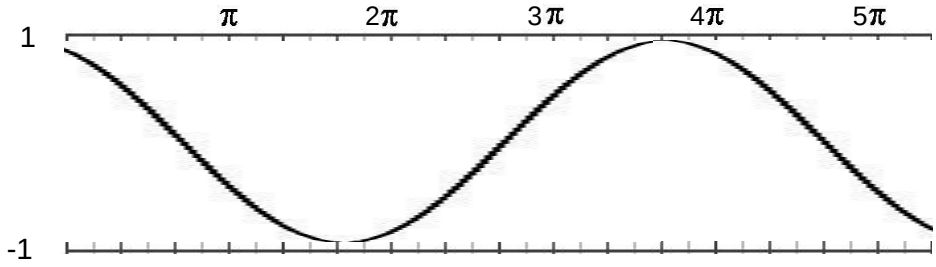
$y = 2\sin(x-\frac{\pi}{4})$



8) function: cos(x), amplitude = 1, period = 4π , phase shift: $\frac{\pi}{3}$ to the left.

Write this function in standard form:

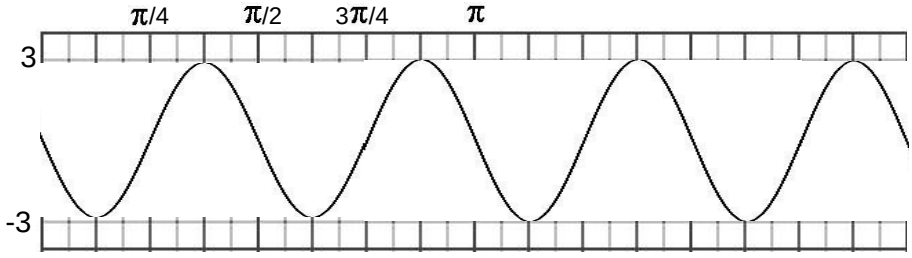
$y = \cos\frac{1}{2}(x+\frac{\pi}{3})$



9) function: sin(x), amplitude = 3, period = $\frac{\pi}{2}$, phase shift: $\frac{\pi}{4}$ to the right.

Write this function in standard form:

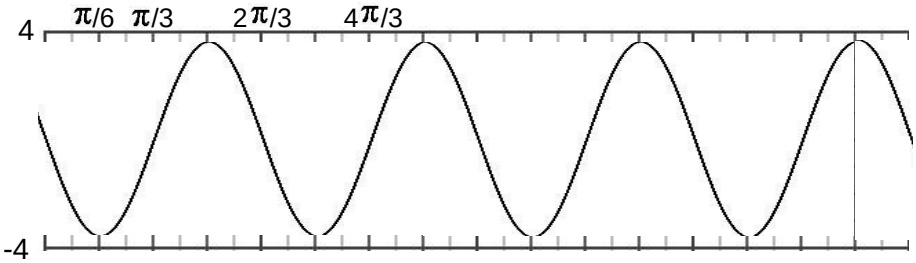
$y = 3\sin 4(x-\frac{\pi}{4})$



10) function: cos(x), amplitude = 4, period = $\frac{2\pi}{3}$, phase shift: $\frac{\pi}{6}$ to the left.

Write this function in standard form:

$y = 4\cos 3(x+\frac{\pi}{6})$



11) function: sin(x), amplitude = 1, period = 8π , phase shift: π to the right.

Write this function in standard form:

$y = \sin\frac{1}{4}(x-\pi)$