Objectives:

- Besides finding the amplitude and period for a sine and cosine function we will add to that finding the displacement and phase shift

On your graphing calculator, let's graph

$y = f(x) = \sin 3x$

$y = f(x) = \sin\left(3x + \dfrac{\pi}{6}\right)$

$y = f(x) = \sin\left(3x - \dfrac{\pi}{6}\right)$

Window
$x_{min} = -0.5$
$x_{max} = 3.0$
$x_{scl} = 0.25$
$y_{min} = -1$
$y_{max} = 1$

Notice in 2nd function: $f(x) = \sin\left(3x + \dfrac{\pi}{6}\right)$

- Curve shifted to the left
- Curve crosses the x-axis at approximately -0.17
- The curve crosses the x axis where y = 0 so $\sin\theta = 0$. For this to be true, the angle must be equal to zero.

  $3x + \dfrac{\pi}{6} = 0$ Now, we'll solve for x below

Notice in 3rd function: $f(x) = \sin\left(3x - \dfrac{\pi}{6}\right)$

- Curve shifted to the right
- Curve crosses the x-axis at approximately -0.17
- The curve crosses the x axis where y = 0 so $\sin\theta = 0$. For this to be true, the angle must be equal to zero.

  $3x - \dfrac{\pi}{6} = 0$ Now, we'll solve for x below

The affect of *c* in the equations $y = a\sin(bx+c)$ *and* $y = a\cos(bx+c)$ is as follows:

If $c > 0$ the curve shifts to the left

If $c < 0$ the curve shifts to the right

The amount of the shift is $-\dfrac{c}{b}$

Summary

Amplitude $= |a|$

Period $= \dfrac{2\pi}{b}$

Displacement $= -\dfrac{c}{b}$

Let's practice graphing some functions:

1. $y = 3\sin\left(4x - \dfrac{\pi}{2}\right)$

    $A = |a| =$

    $P = \dfrac{2\pi}{b} =$

    $d = -\dfrac{c}{b} =$

2. $y = -4\cos\left(3x + \dfrac{\pi}{3}\right)$

$A = |a| =$

$P = \dfrac{2\pi}{b} =$

$d = -\dfrac{c}{b} =$

3. $y = \dfrac{1}{3}\cos\left(\dfrac{1}{2}x - \dfrac{\pi}{8}\right)$

$A = |a| =$

$P = \dfrac{2\pi}{b} =$

$d = -\dfrac{c}{b} =$

You try the following:

4. $y = 2\sin\left(\dfrac{1}{4}x + \dfrac{\pi}{2}\right)$

$A = |a| =$

$P = \dfrac{2\pi}{b} =$

$d = -\dfrac{c}{b} =$

5. $y = -25\cos\left(3\pi x - \dfrac{\pi}{2}\right)$

$A = |a| =$

$P = \dfrac{2\pi}{b} =$

$d = -\dfrac{c}{b} =$

6. $y = -3\sin\left(4x + \dfrac{\pi}{6}\right)$

   $A = |a| =$

   $P = \dfrac{2\pi}{b} =$

   $d = -\dfrac{c}{b} =$

7. The electric current I (in μA) in a certain circuit is given by $i = 3.8\cos 2\pi(t + 0.20)$, where t is the time in seconds. Sketch three cycles of this function.

Let's check out this youtube video (I-phone inside a guitar)
http://www.sun-gazing.com/man-puts-iphone-inside-guitar-begins-play-captures-stunning/

Web cam in guitar - https://www.youtube.com/watch?v=9M8Ev5bTJ9s

8. Write the equation for the given function with the given amplitude, period and displacement respectively: $\cos ine,\ 8,\ \dfrac{2\pi}{3},\ \dfrac{\pi}{3}$

9. Write the equation for the given function with the given amplitude, period, and displacement respectively: $sine,\ 18,\ 4, -1$

Let's play "What's My Function"? In each case, write the equation for
$y = a\sin(bx+c)$ *and* $y = a\cos(bx+c)$