Graphing Trigonometric Function

Turn on the calculator. Now press the **Mode** key and make sure all of the following is highlighted.

Normal Sci Eng
Float 0123456789
Radian Degree
Func Par Pol Seq
Connected Dot
Sequential Simul
Real a+bi re^ i
Full Horiz G-T

Now press the **2nd** key and then the **Zoom** button to get into the **Format** window and make sure all of the following is highlighted.

RectGC Polar GC
CoordOn CoordOff
GridOff GridOn
AxesOn AxesOff
LabelOff LabelOn
ExprOn ExprOff

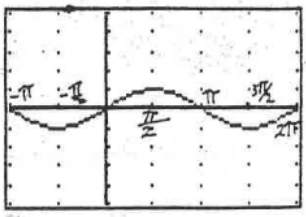
Now that you have all of the items highlighted press the **Window** key and set to these values:

WINDOW
Xmin=−π
Xmax=2π
Xscl=π /2
Ymin=−5
Ymax=5
Yscl=1
Xres=1

Okay, Let's graph! Press the **y =** key on the top left row of the calculator. If there is anything on the **:y =** just move the cursor to the line and depress the **Clear** key. Your screen should look like this:

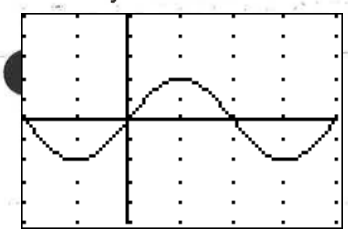
:Y1=
:Y2=
:Y3=
:Y4=

Now press **Sin X** to graph y = sin x and press the **Graph** key. You should get this ----

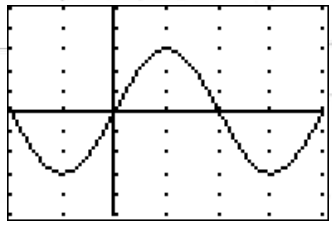


Now you are going to graph some trig functions and record your pictures. Remember we are looking for patterns or characteristics common among these graphs so that we will be able to sketch these graphs without using a graphing calculator.

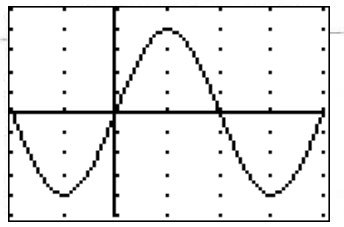
y = 2 sin x



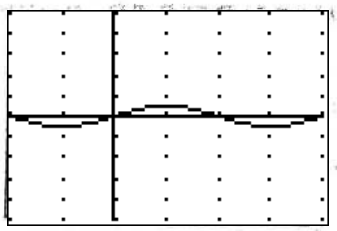
y = 3 sin x



y = 4 sin x



$y = \frac{1}{2} \sin x$ or .5 sin x

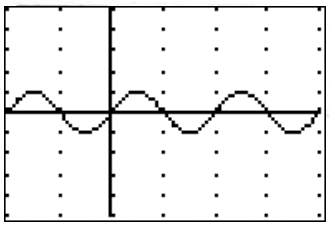


What observations can you make looking at these graphs in relation with y = sin x

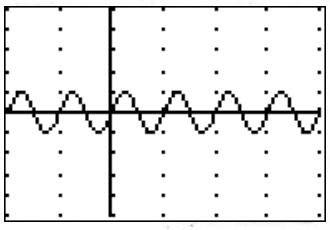
The height of the graph changes or there's a vertical stretch. We call this the Amplitude of the graph.

Now graph the following:

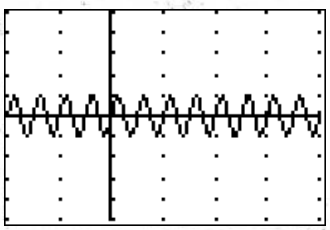
y = sin 2x



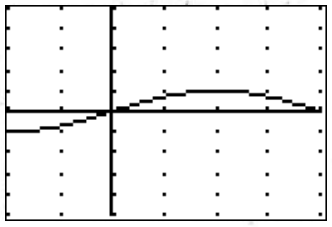
y = sin 4x



y = sin 8x



y = sin .5x

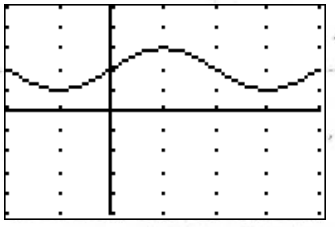


What observations can you make looking at these graphs in relation with y = sin x

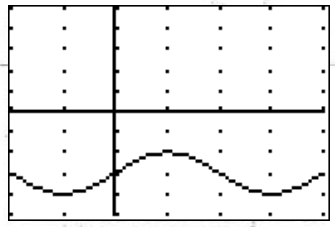
There was a horizontal shrink for the #s greater than 1 and a horizontal stretch for the numbers greater than 1. We call this the period of the function. It determines how long one cycle of the graph is.

Graph these functions

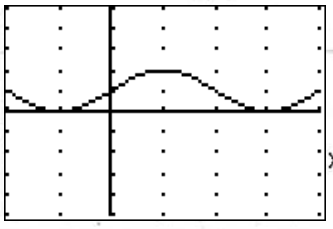
y = sin x + 2



y = sin x - 3



y = sin x + 1

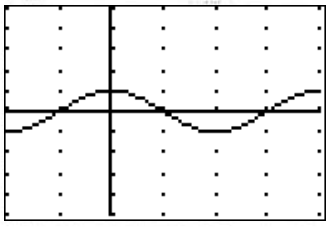


What do you observe for these graphs?

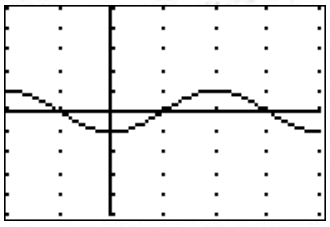
These graphs shift up(+) or down(-). We call this the vertical shift.

Graph these functions:

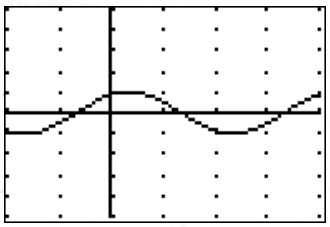
$y = \sin\left(x + \frac{\pi}{2}\right)$



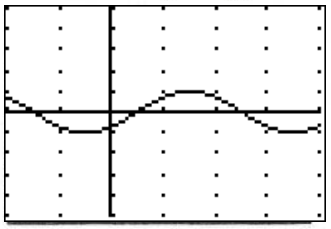
$y = \sin\left(x - \frac{\pi}{2}\right)$



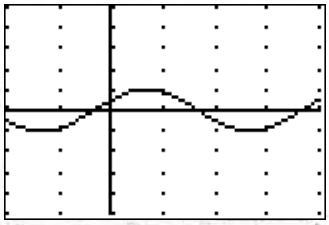
$y = \sin\left(x + \frac{\pi}{3}\right)$



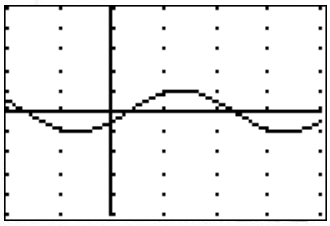
$y = \sin\left(x - \frac{\pi}{4}\right)$



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



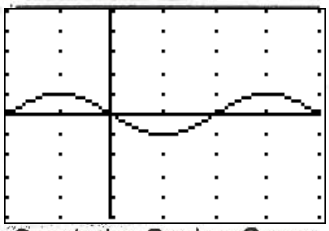
$y = \sin\left(x - \frac{\pi}{6}\right)$



What observations can you make looking at these graphs in relation with y = sin x

These graphs shift left(+) and right(-). We call this the phase shift of the graph. For example, the first one would have a -pi/2 phase shift or it would shift left pi/2.

Graph $y = -\sin x$

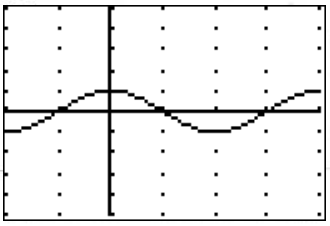


What is your observation:

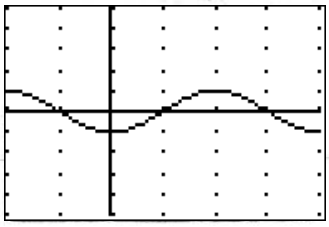
The negative in front, causes the graph to reflect over the x-axis.

Now Graph the Cosine Curve.

$y = \cos x$



$y = -\cos x$

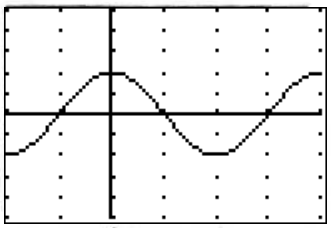


What is the difference in the two above graphs

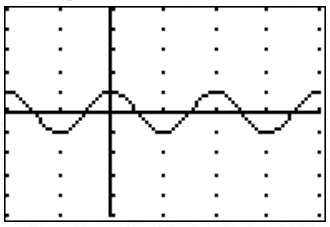
The negative in front, causes the graph to reflect over the x-axis.

Using the relationships you observed with the sin curve, sketch the following cosine curves and then enter them into you graphing calculator.

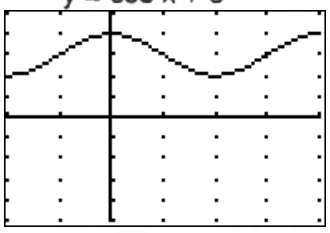
$y = 2\cos x$



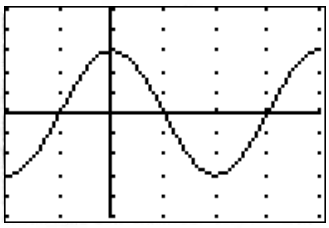
$y = \cos 2x$



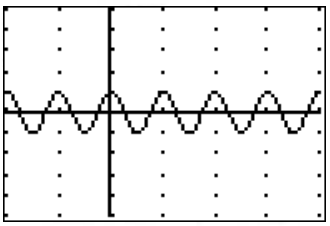
$y = \cos x + 3$



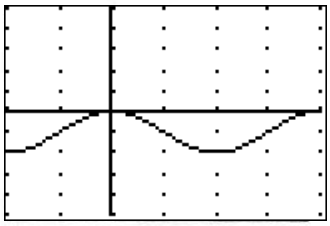
$y = 3\cos x$



$y = \cos 4x$

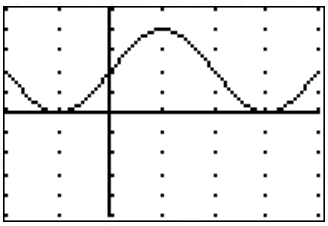


$y = \cos x - 1$

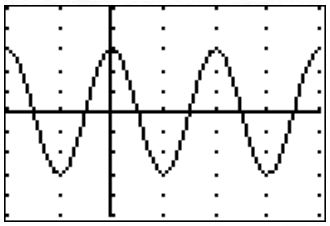


Now try to sketch these first and then check on your calculator

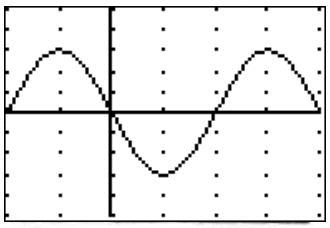
$y = 2\sin x + 2$



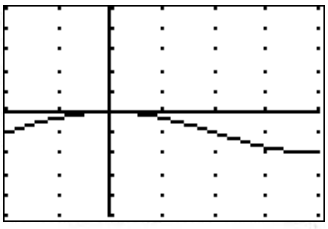
$y = 3\cos 2x$



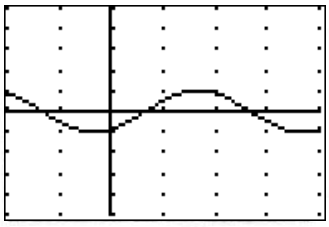
$y = -3\sin x$



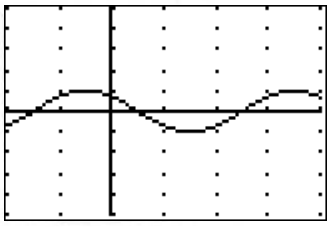
$y = \cos \frac{1}{2}x - 1$



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



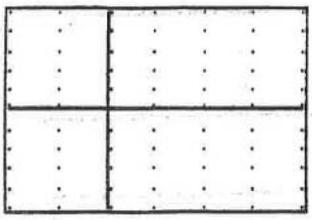
$y = \cos\left(x + \frac{\pi}{4}\right)$

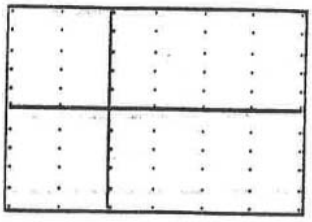


Challenge Problems: Sketch first and then check with the calculator

$y = 2\sin\left(x + \frac{\pi}{4}\right) + 3$ $y = 3\sin\left(2x + \frac{\pi}{3}\right)$

This graph will probably not match your sketch. What happened?





Now your teacher will go over some definitions of the following terms.

Amplitude -

|A| represents the Amplitude of the curve. This is the height from the x-axis to the peak (or valley).

Period - (T)

The length of the curve before it repeats itself. Find this by doing: $T = \frac{2\pi}{\omega}$

Shift-up or Shift-down

Controlled by the k value (what's added or subtracted outside the ( )). Up if it's positive and down if it's negative.

Phase-Shift-

Controlled by what's inside the ( ). Shift right if it's subtraction and left if it's addition. You shift a distance of $\frac{\phi}{\omega}$

$$y = A\sin(\omega x - \phi) + k \quad or \quad y = A\cos(\omega x - \phi) + k$$

factored: $y = A\sin\omega\left(x - \frac{\phi}{\omega}\right) + k$ or $y = A\cos\omega\left(x - \frac{\phi}{\omega}\right) + k$