

## Creating Graphs of Common Trig Functions with the Unit Circle on the TI-84

Turn on the calculator. Change the mode to Parametric equations.

Enter the equations  $x_1t = \cos t$ ,  $y_1t = \sin t$  into the first set of equations.

Set the window to have  $t$  start at 0 and go to  $2\pi$  at steps of 0.1. Have  $-1.5 \leq x \leq 2\pi$  and  $-2.566 \leq y \leq 2.566$ . Graph this pair of functions and you should notice a unit circle. Trace around the circle to various locations and read the coordinates. If you want a specific point, type that number in after you press trace.

Let's look at a graph  $y = \sin x$ .

Enter a second set of parametric equations:  $x_2t = t$ ,  $y_2t = \sin t$ . You should see the unit circle and a new graph of  $y = \sin x$ . Press TRACE. To reach a specific  $t$  value, type in the value after you have pressed TRACE. As you locate a point on the unit circle, use the up or down arrows to move to the graph. You will find the corresponding points between the unit and circle and the sine graph.

Record the values of the  $\sin x$  for the following  $x$  values:

$x$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$
$\sin x$							

$x$	$\frac{5\pi}{6}$	$\pi$	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$
$\sin x$							

$x$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	$2\pi$				
$\sin x$							

As you move around the circle, notice where some of these points appear on the sine graph.

Enter a third set of parametric equations:  $x_3t = t, y_3t = \cos t$ . You should see the unit circle and a new graph of  $y = \sin x$ . Press TRACE. To reach a specific  $t$  value, type in the value after you have pressed TRACE. As you locate a point on the unit circle, use the up or down arrows to move to the graph. You will find the corresponding points between the unit and circle and the sine graph.

Record the values of the  $\sin x$  for the following  $x$  values:

X	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$
COS X							

X	$\frac{5\pi}{6}$	$\pi$	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$
COS X							

X	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	$2\pi$				
COS X							

As you move around the circle, notice where some of these points appear on the sine graph.

You can continue to study other trigonometric functions by replacing the second of the two equations with  $\tan t$ ,  $\cot t$ ,  $\sec t$ , and  $\csc t$ .