

Name: \_\_\_\_\_

## Sine and Cosine Graph Notes

You have now created the outlines of the graphs of sine and cosine from 0 to  $2\pi$  by plotting points for the special angles. However, the domain for sine and cosine includes all angles and you have only plotted the special angles. The actual points are at the outside part of each rectangular piece and can be represented by a smooth curve connecting these points. Draw a smooth curve for each function.

a. How do the two graphs compare?

$y = \cos \theta$  is shifted  $\frac{\pi}{2}$  to the right.

They are generally a similar shape. They have the same domain & range.

b. How long does it take for each curve to complete one full cycle? How is this related to the unit circle?

It takes  $2\pi$  to complete one full cycle. This is the same as one full rotation around the unit circle.

Notice that  $\theta$  was used instead of  $x$  as the independent variable for sine and cosine in the previous problems. There are two reasons for this:  $\theta$  reminds us that the argument is an angle, and it also distinguishes the input from the output of the cosine function, which is an  $x$ -coordinate on the unit circle. Since sine and cosine are both functions, function notation can be used, as well as the standard input,  $x$ .

a. What are the domain and range of  $f(x) = \sin(x)$ ?

Domain:  $\mathbb{R}$

Range:  $-1 \leq y \leq 1$

b. What are the domain and range of  $f(x) = \cos(x)$ ?

Domain:  $\mathbb{R}$

Range:  $-1 \leq y \leq 1$

c. Graph  $y = \sin(x)$  and  $y = \cos(x)$  on a graphing calculator. Adjust your window so that your domain is  $-2\pi \leq x \leq 2\pi$  and your range is  $-4 \leq y \leq 4$ . Approximately how many cycles are shown on your graph for each function?

2 full cycles.

d. Are sine and cosine each even, odd, or neither? Use the unit circle and the graphs you created to justify your answer. Remember: A function is even if and only if  $f(x) = f(-x)$  and odd if and only if  $-f(x) = f(-x)$ .

$f(x) = \sin(x)$  is odd

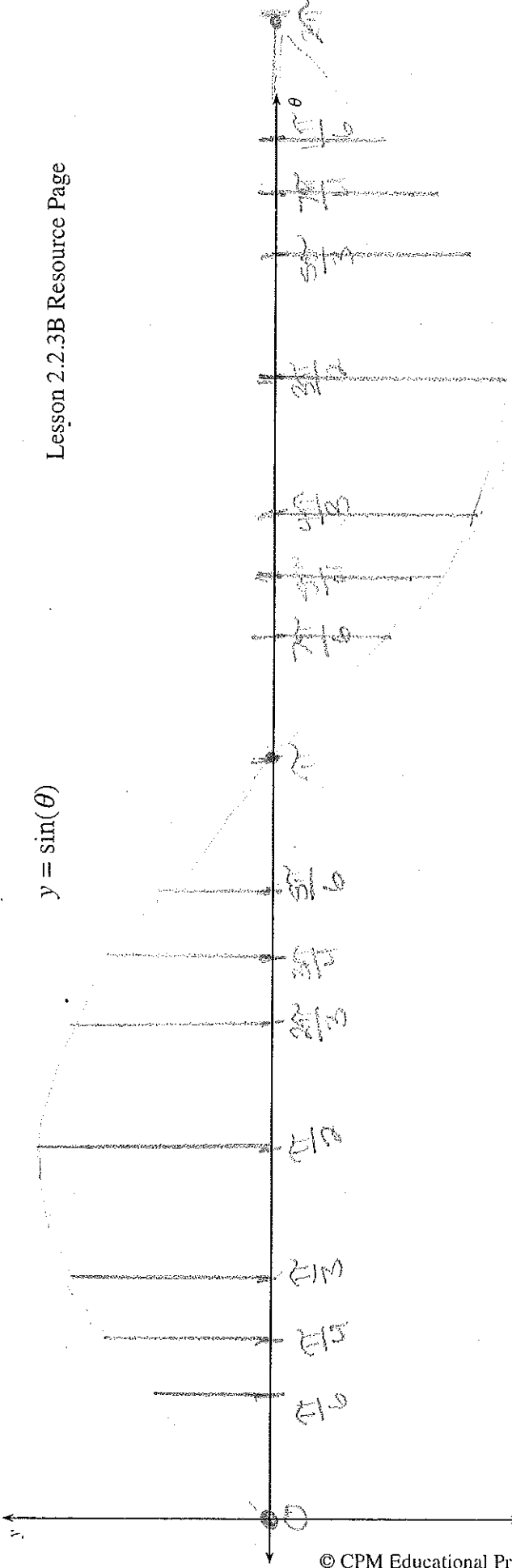
$f(x) = \cos(x)$  is even

e. Add the graphs of  $y = \sin(x)$  and  $y = \cos(x)$  to your Parent Graph Graphic Organizer.

# Sine and Cosine Graph Notes

Lesson 2.2.3B Resource Page

$y = \sin(\theta)$



$y = \cos(\theta)$

