

4-5 The Sine and Cosine Functions



Goal: Graph and analyze the functions sine: $\theta \rightarrow \sin \theta$ and cosine: $\theta \rightarrow \cos \theta$

Warm Up:

Without using a calculator, given that $\sqrt{2} \approx 1.414$ and $\sqrt{3} \approx 1.732$, approximate to the nearest hundredth:

1. $\frac{\sqrt{2}}{2}$
2. $\frac{\sqrt{3}}{2}$
3. $\frac{\sqrt{3}}{3}$
4. $(\sqrt{2})^2$

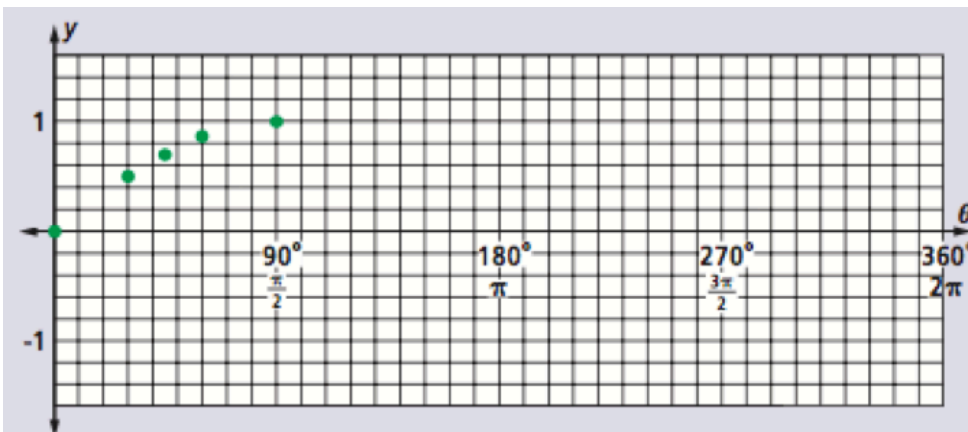
Activity: Exploring the shape of sine function.

1. Complete the table below using the unit circle and $\sin \theta$.

θ (degrees)	0°	30°	45°	60°	90°	120°	135°	150°	180°
θ (radians)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\sin \theta$ (exact)	0	$\frac{1}{2}$				$\frac{\sqrt{3}}{2}$			
$\sin \theta$ (approx.)	0						0.707		

θ (degrees)	210°	225°	240°	270°	300°	315°	330°	360°
θ (radians)	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$				2π
$\sin \theta$ (exact)	0	$-\frac{\sqrt{2}}{2}$				$\frac{\sqrt{3}}{2}$		
$\sin \theta$ (approx.)	0				-0.866			

2. The first five points of the table are plotted below. Plot the remaining points and draw a *smooth* curve through the points.



Questions

Questions

3. Check your graphing by graphing $y = \sin \theta$ on your handy dandy graphing calculator.

The Graph of the Sine Function

Based on the graph and table, we see that the sine function is positive _____ and negative _____.

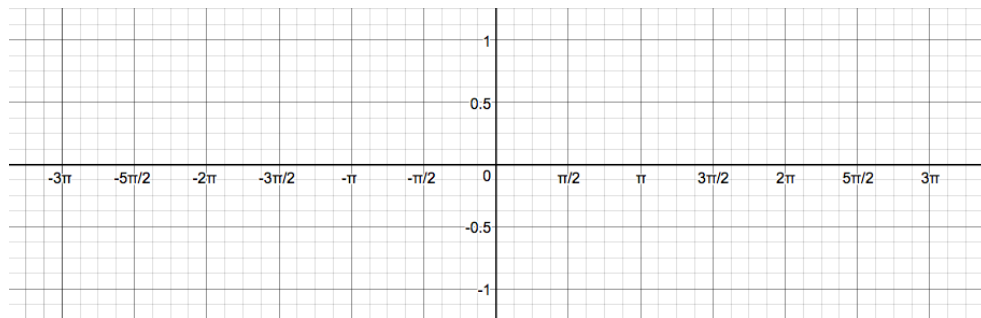
How can a bear graph the sine function quickly? Good question.



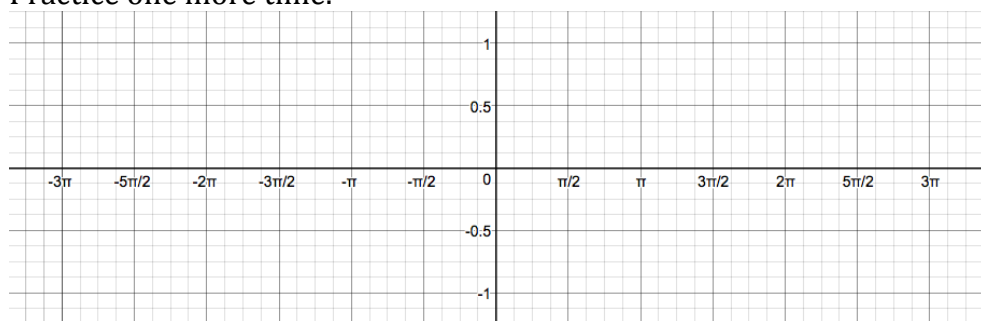
Characteristics of the Sine Function

- a. Passes through the _____
- b. First MAXIMUM at _____
- c. x -intercept every _____
- d. First minimum at _____
- e. Rinse and repeat

Sketch the sine function below



Practice one more time.



Questions

The Cosine Function

Recall the complements theorem that states:

$$\cos(90^\circ - \theta) = \underline{\hspace{2cm}} = \underline{\hspace{2cm}},$$

$$\sin(90^\circ - \theta) = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

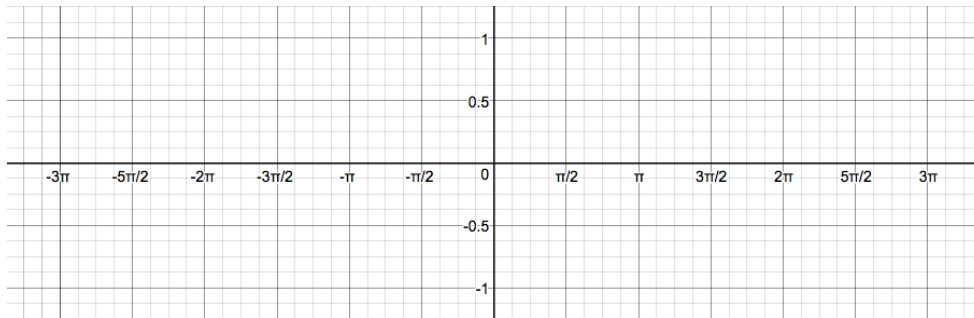
Thus, we see that the sine function is simply the cosine function

_____.

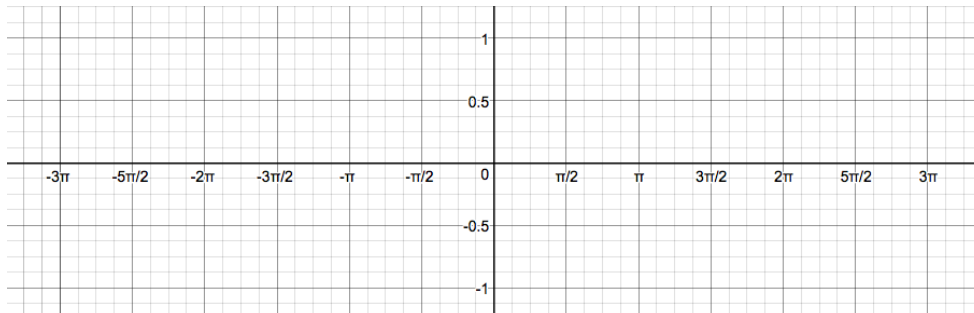
Characteristics of the Cosine Function

- a. Passes through _____
- b. Which is the first _____
- c. x-intercept every _____
- d. First minimum at _____
- e. Rinse and repeat

Sketch the cosine function below



Practice one more time.



Questions

Practice

1. Complete the following table.

	$f(\theta) = \sin \theta$	$g(\theta) = \cos \theta$
Domain		
Range		
Zeros		
Period		
Even, Odd, or Neither		

2. For what values of x between 0 and -2π are both $\cos x$ and $\sin x$ negative?

In 3-11, identify which, if any, of the parent trigonometric functions so far have graphs with the given characteristics.

4. Symmetry with respect to the origin _____
5. Symmetry with respect to x -axis _____
6. Symmetry with respect to y -axis _____
7. Horizontal asymptotes _____
8. x -intercepts at integer multiples of π _____
9. y -intercept -1 _____
10. y -intercept 1 _____
11. y -intercept 0 _____

Summary: