

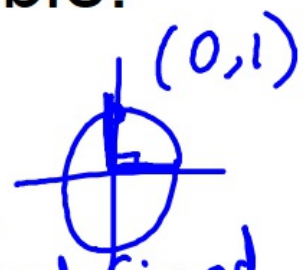
# Warm Up

Write the radians associated with the following angles in a table:


1.

0	$0\pi$
45	$\pi/4$
90	$\pi/2$
135	$3\pi/4$
180	$\pi$
225	$5\pi/4$
270	$3\pi/2$
315	$7\pi/4$
360	$2\pi$

2.  $\sec(90)$

$$\frac{1}{\cos\theta} = \frac{1}{x} = \frac{1}{0} = \text{undefined}$$


3.  $\cot(300)$



$$\left( \frac{1}{2}, -\frac{\sqrt{3}}{2} \right)$$

x    y

$$\frac{y}{x} = \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{1}{2} \cdot \frac{-\sqrt{3}}{1} = -\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

Keep

exact value

$$= \frac{-\sqrt{3}}{3}$$

## 5.1 Converting Degrees & Radians

## 5.2 & 5.3 Using the Unit Circle

## 5.4 Graphing Trig Functions

\* TO GRAPH  
FUNCTIONS  
PUT CALC TO  
RADIAN  
MODE ;

\* TO CALC.  
USE DEGREE  
MODE !

## **5.4 SWBAT:**

1. Graph sine, cosine, and tangent functions.
2. Graph & identify transformations of functions.

## **Why?**

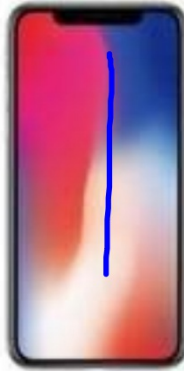
Graphing sine & cosine functions are used to model waves & periodic behavior.

- music
- radio wave frequencies
- sonar devices

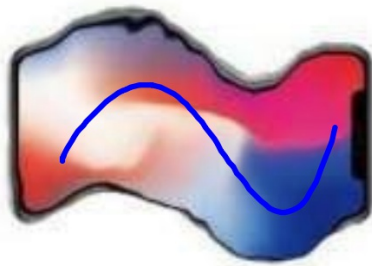
Math Joke



IPHONE X



IPHONE Y



IPHONE  $Y=\sin(X)$

## Things to think about...

- The x-axis represents angle measures (in radians)  
It's like the Unit Circle "unwrapped"
- The y-axis is regular numbers
- One full period is  $2\pi$  - it's one complete cycle of the graph

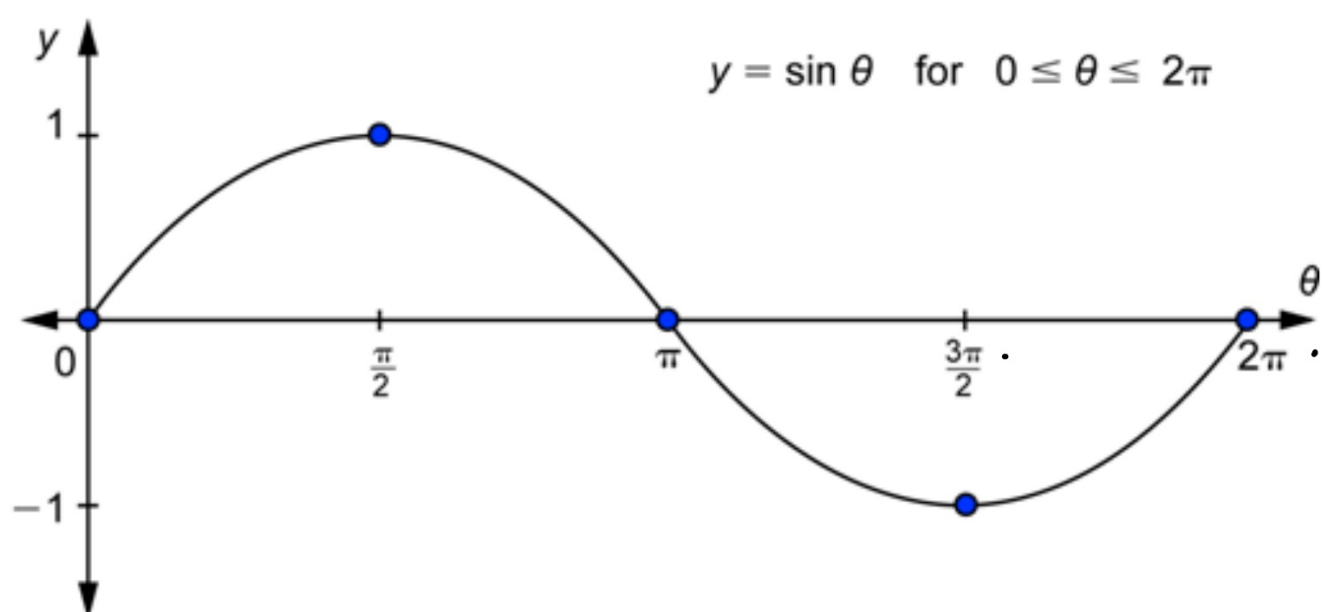
**Sinusoid:**

$$y = A \sin(Bx \pm C) \pm D$$

$$y = A \cos(Bx \pm C) \pm D$$

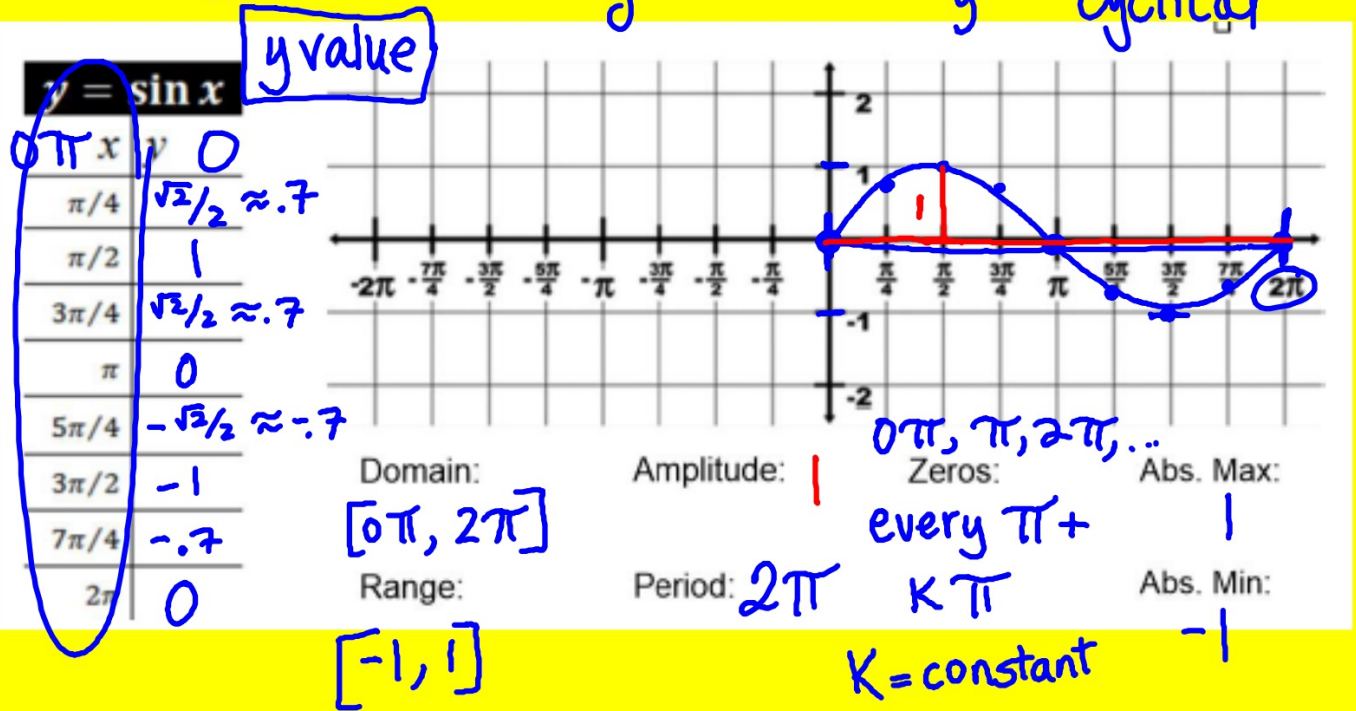
standard  
form

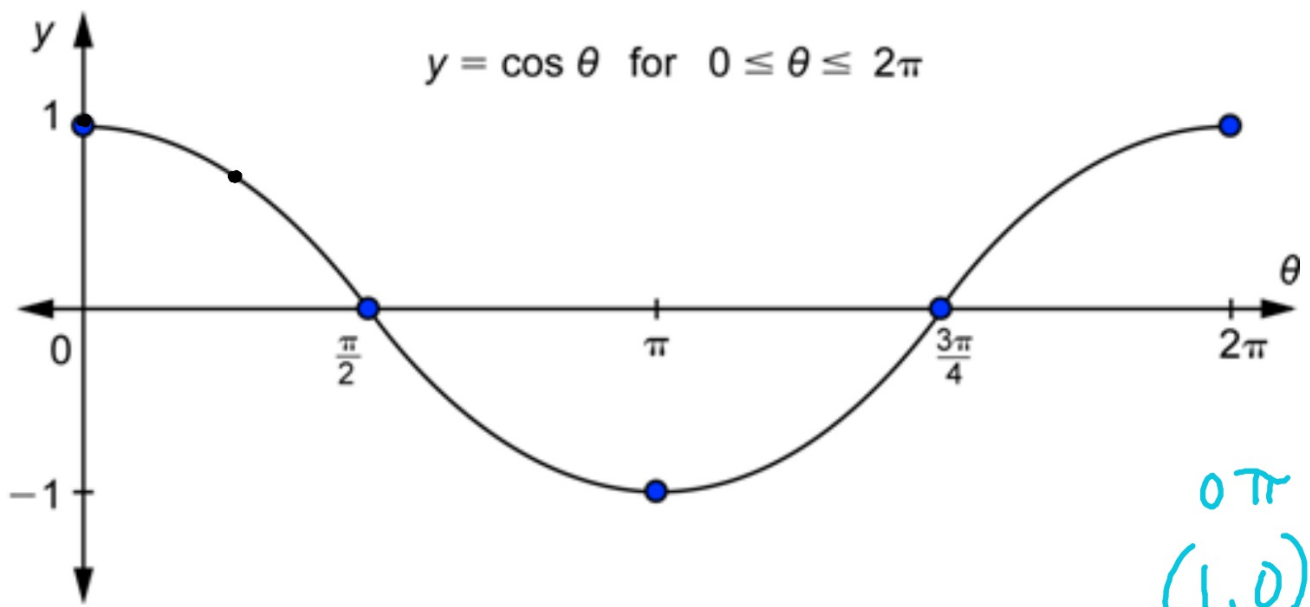






$0\pi \rightarrow (1, 0)$   $\frac{\pi}{4} \rightarrow (\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$   $\frac{\pi}{2} \rightarrow (0, 1)$   
 Graphing  $y = \sin(x)$  Periodic cyclical





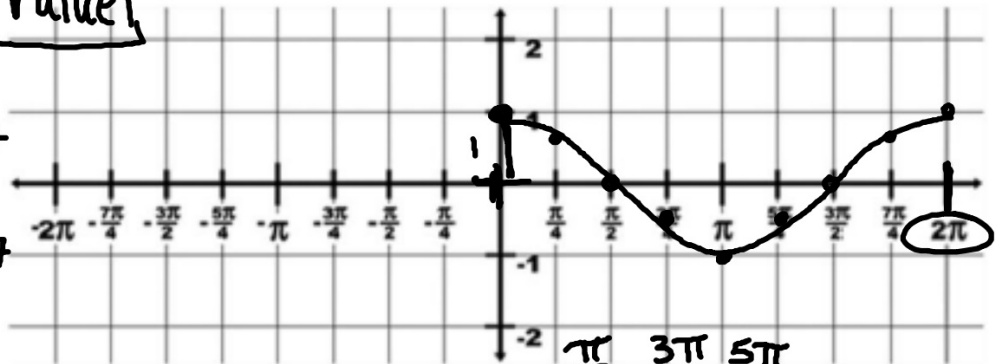
$0 \pi$   
 $(1, 0)$   
 $\uparrow \quad \uparrow$   
 $\cos \sin$

$$\pi/2 \rightarrow (0, 1) \rightarrow 0$$

x value

$$y = \cos x$$

$x$	$y$
$0$	$1$
$\pi/4$	$\sqrt{2}/2 \approx .7$
$\pi/2$	$0$
$3\pi/4$	$-\sqrt{2}/2 \approx -.7$
$\pi$	$-1$
$5\pi/4$	$-.7$
$3\pi/2$	$0$
$7\pi/4$	$.7$
$2\pi$	$1$



Domain:

$$[0, 2\pi]$$

Range:  $[-1, 1]$

Amplitude:

$$1$$

Period:

$$2\pi$$

$$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots$$

Zeros: every  $\frac{\pi}{2}$

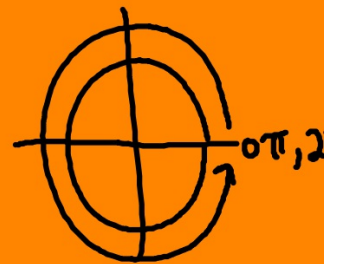
$$+ k\pi$$

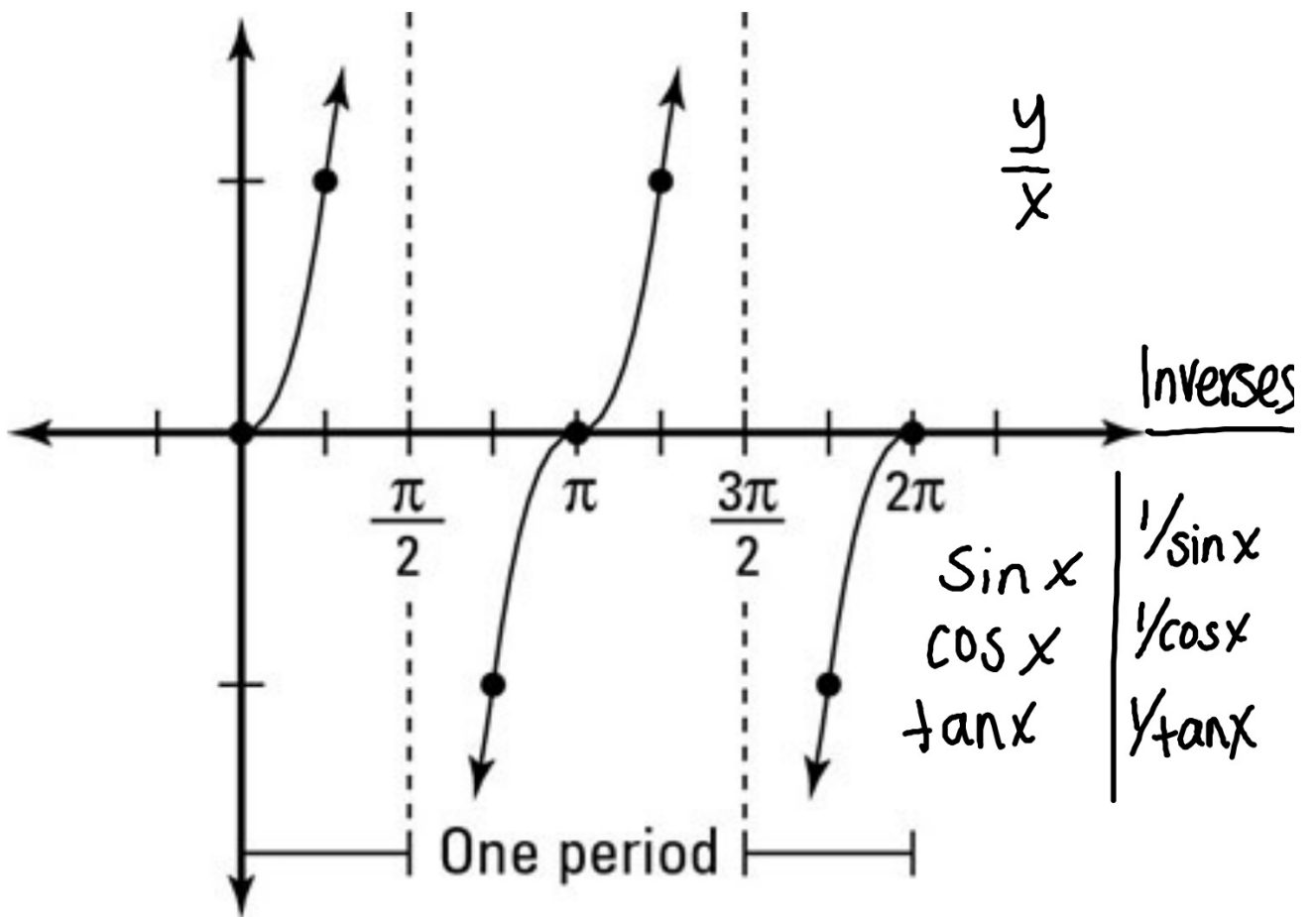
Abs. Max:

$$1$$

Abs. Min:

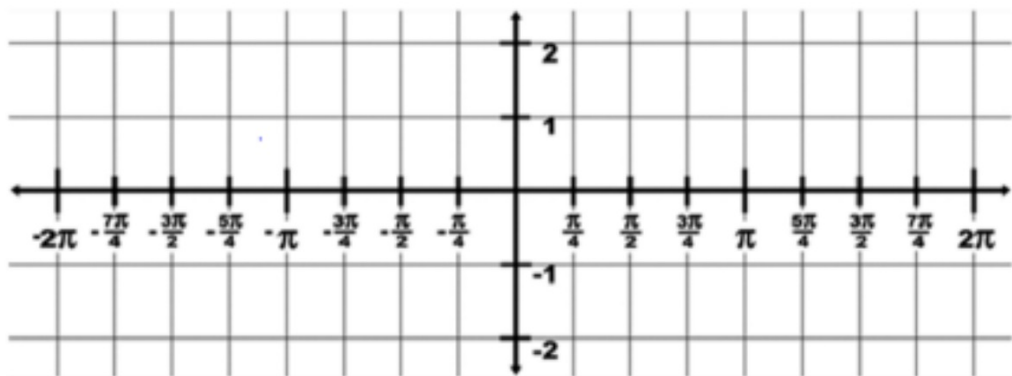
$$-1$$





$$y = \tan x$$

$x$	$y$
$\pi/4$	
$\pi/2$	
$3\pi/4$	
$\pi$	
$5\pi/4$	
$3\pi/2$	
$7\pi/4$	
$2\pi$	



Domain:

Amplitude:

Zeros:

Range:

Period:

Asymptotes:

Ex 1: Find the amplitude of each function & describe any transformations from  $y_1$ .

a)  $y_1 = \cos x$

$a = 1$     $b = 1$     $c = 0$     $d = 0$   
 $P = \frac{2\pi}{1} = 2\pi$

$a =$  amplitude  
 $b =$  frequency

b)  $y_2 = 0.5 \cos(x - 4)$

$a = .5$     $b = 1$     $c = -4$     $d = 0$   
 vertical shrink    $P = 2\pi$    Right 4

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

$c =$  phase shift

c)  $y_3 = 3 \cos(x + 2)$

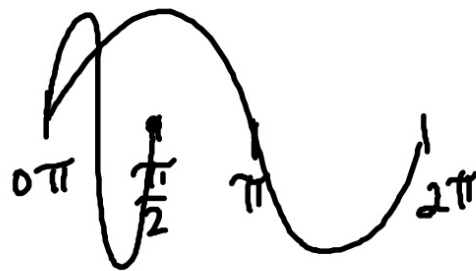
$a = 3$     $b = 1$     $d = 2$   
 flip over x axis   vertical stretch    $P = 2\pi$    up 2

$\frac{c}{B}$

$d =$  displacement

d)  $y_4 = -\cos(4x) - 2$

$a = 1$     $b = 4$     $d = -2$   
 flip over x axis   wave speeds up   down 2  
 $P = \frac{2\pi}{4} = \frac{\pi}{2}$



Ex 2: Find the period of each function & describe any transformations from  $y_1$ .

a)  $y_1 = \sin x$     $a=1$     $b=1$     $c=0$     $d=0$

b)  $y_2 = -2 \sin(x/3)$

$\frac{1}{3} b = \frac{1}{3}$

$-2 \sin(\frac{1}{3}x)$     $a=2$     $b=\frac{1}{3}$

flip over vertical stretch  $p = \frac{2\pi}{1/3} = 6\pi$   
x axis

c)  $y_3 = 3 \sin(2x)$

$a=3$

v. stretch

flip over y axis

$b=2$

$p = \frac{2\pi}{2} = \pi$

wave slows down

d)  $y_4 = 9 \cos(2x + 8) - 5$

wave speeds up

vertical stretch

$a=9$

$b=2$

$p = \frac{2\pi}{2} = \pi$

speeds up

$d = -5$   
down 5

$c = 8$   
phase shift  
 $\frac{c}{b} = \frac{8}{2} = 4$   
left 4

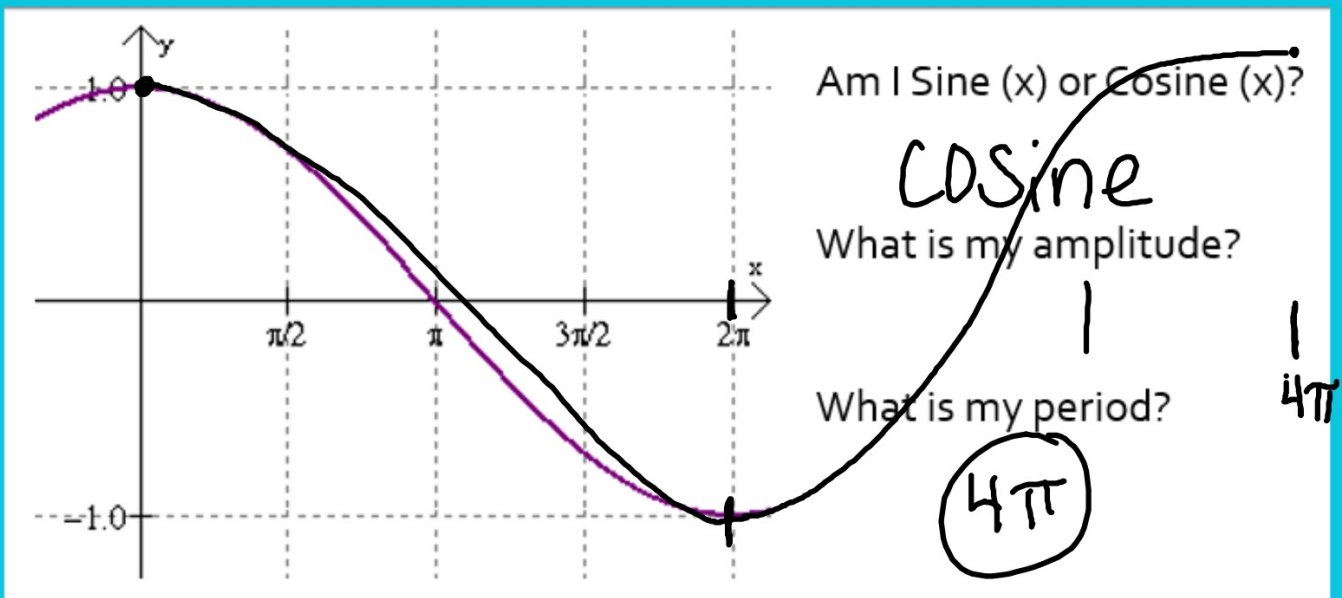
## Who Am I Activity!

Materials: - lined paper  
- pencil

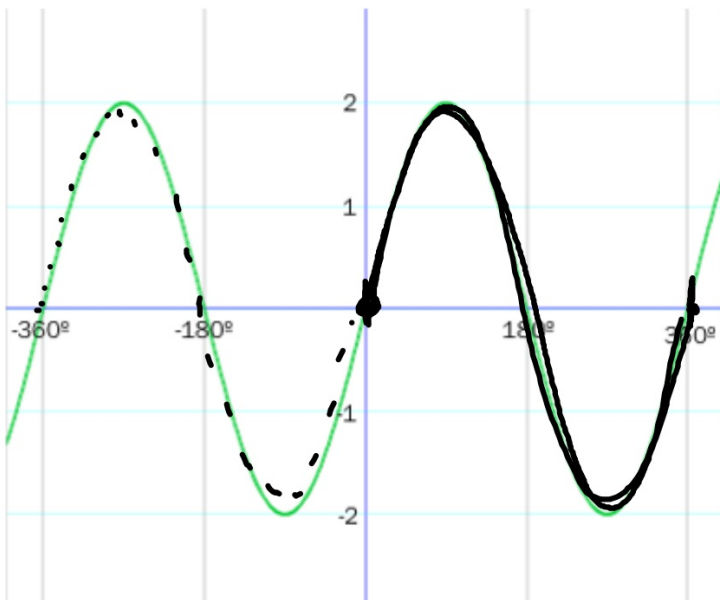
Collaboration: Teams of 3-4



# Who am I? #1



## Who am I? #2



Am I Sine (x) or Cosine (x)?

Sine

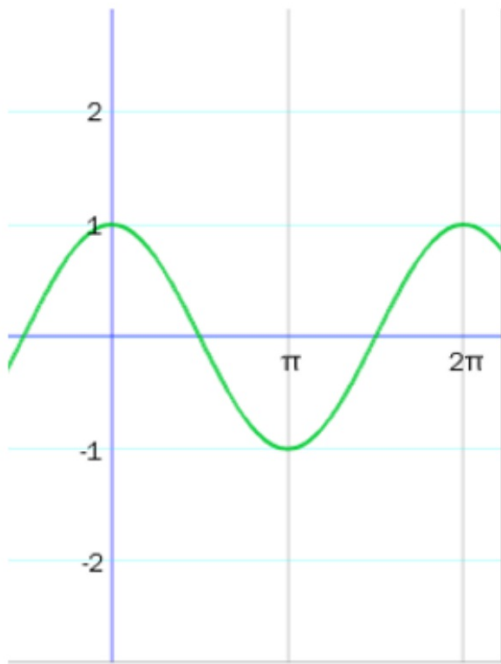
What is my amplitude?

2

What is my period?

$$360^\circ = 2\pi$$

# Who am I? #3

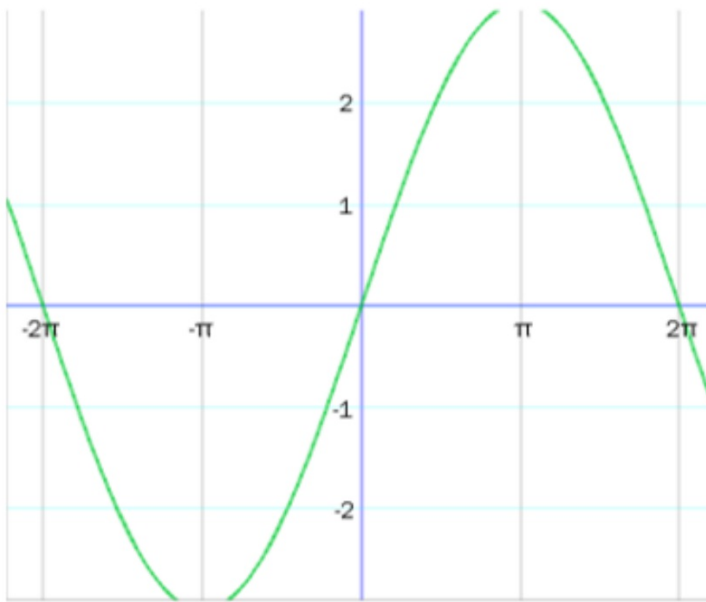


Am I Sine (x) or Cosine (x)?

What is my amplitude?

What is my period?

# Who am I? #4

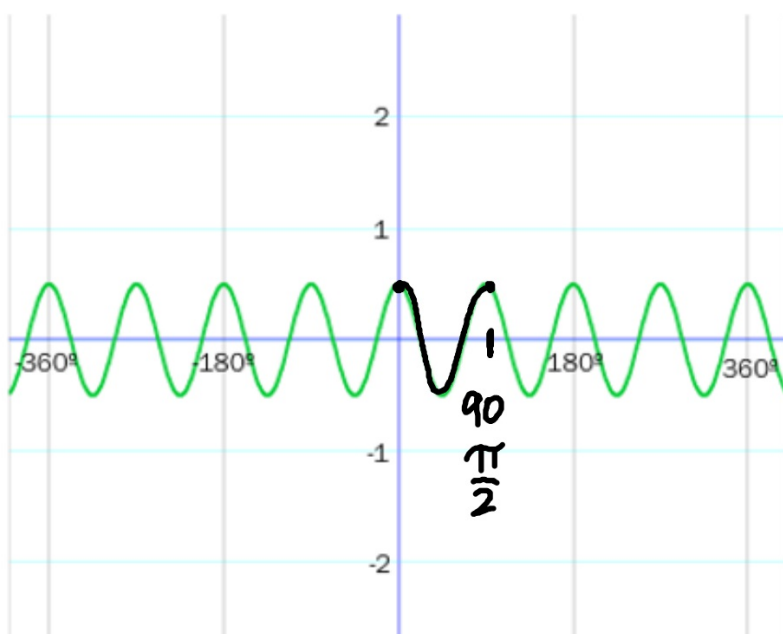


Am I Sine (x) or Cosine (x)?

What is my amplitude?

What is my period?

# Who am I? #5



Am I Sine (x) or Cosine (x)?

COS

What is my amplitude?

$\frac{1}{2}$  or .5

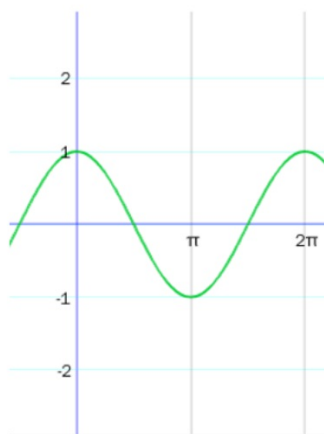
What is my period?

$$\frac{\pi}{2}$$

# Exit Ticket

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1.



Am I Sine (x) or Cosine (x)?

What is my amplitude?

What is my period?

2. Identify the amplitude, frequency, period, and the y-intercept of the equation:  $y = 3\sin(4x)$

3. How does the graph of  $g(x) = 2\sin(2x)$  differ from the graph of its parent function,  $f(x) = \sin(x)$ ?

