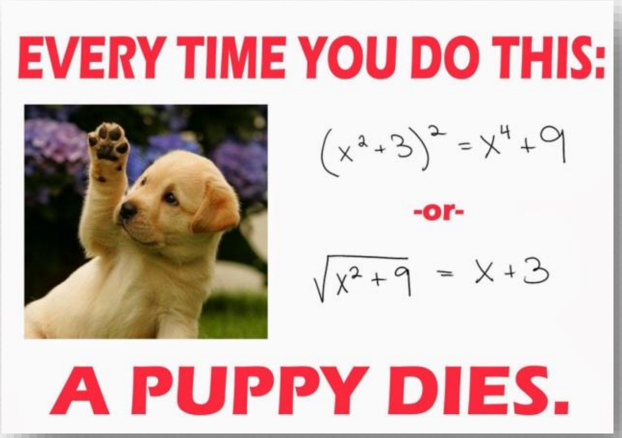
Monday, December 8, 2014

WARM UP

1. Expand the expression $(x^2 + 3)^2$

2. Factor the expression $x^2 - 2x - 8$

3. Find the roots of $4x^2 - x + 1$ by graphing.



1 2 3 4 5 6 7 8 9 10

Objectives

- Distinguish between the graphs of sine, cosine and tangent functions
- Identify the Period, Amplitude, Phase Shift, and Midline from the graph of a trigonometric function.
- Identify the Period, Amplitude, Phase Shift, and Midline from the graph of a trigonometric function.

Homework

- Graphing Worksheets, all problems

Homework Review

key is on my website

TRIGONOMETRIC IDENTITIES

Reciprocal Identities:

$$\sin x = \frac{1}{\csc x} \qquad \cos x = \frac{1}{\sec x} \qquad \tan x = \frac{1}{\cot x}$$

$$\csc x = \frac{1}{\sin x} \qquad \sec x = \frac{1}{\cos x} \qquad \cot x = \frac{1}{\tan x}$$

Quotient Identities:

$$\tan x = \frac{\sin x}{\cos x} \qquad \cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities:

$$\sin^2 x + \cos^2 x = 1 \qquad 1 + \tan^2 x = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

Unit Circle Quiz

Put in your degrees first

Convert to Radians $\left(\frac{\pi}{180}\right)$

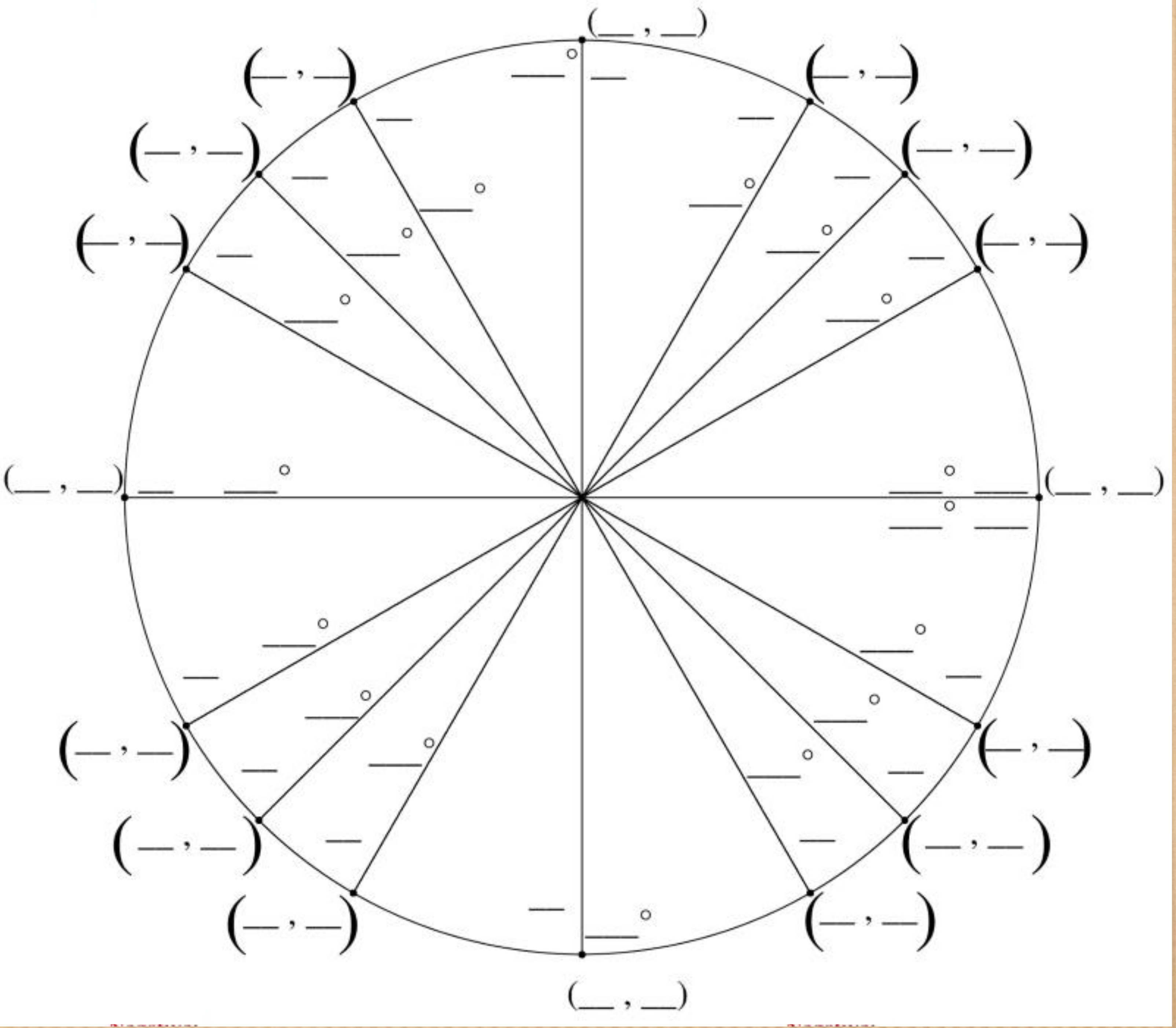
Put in the coordinates for the 90 degree increments

Fill in the first quadrant coordinates.

Remember all are fractions over 2.

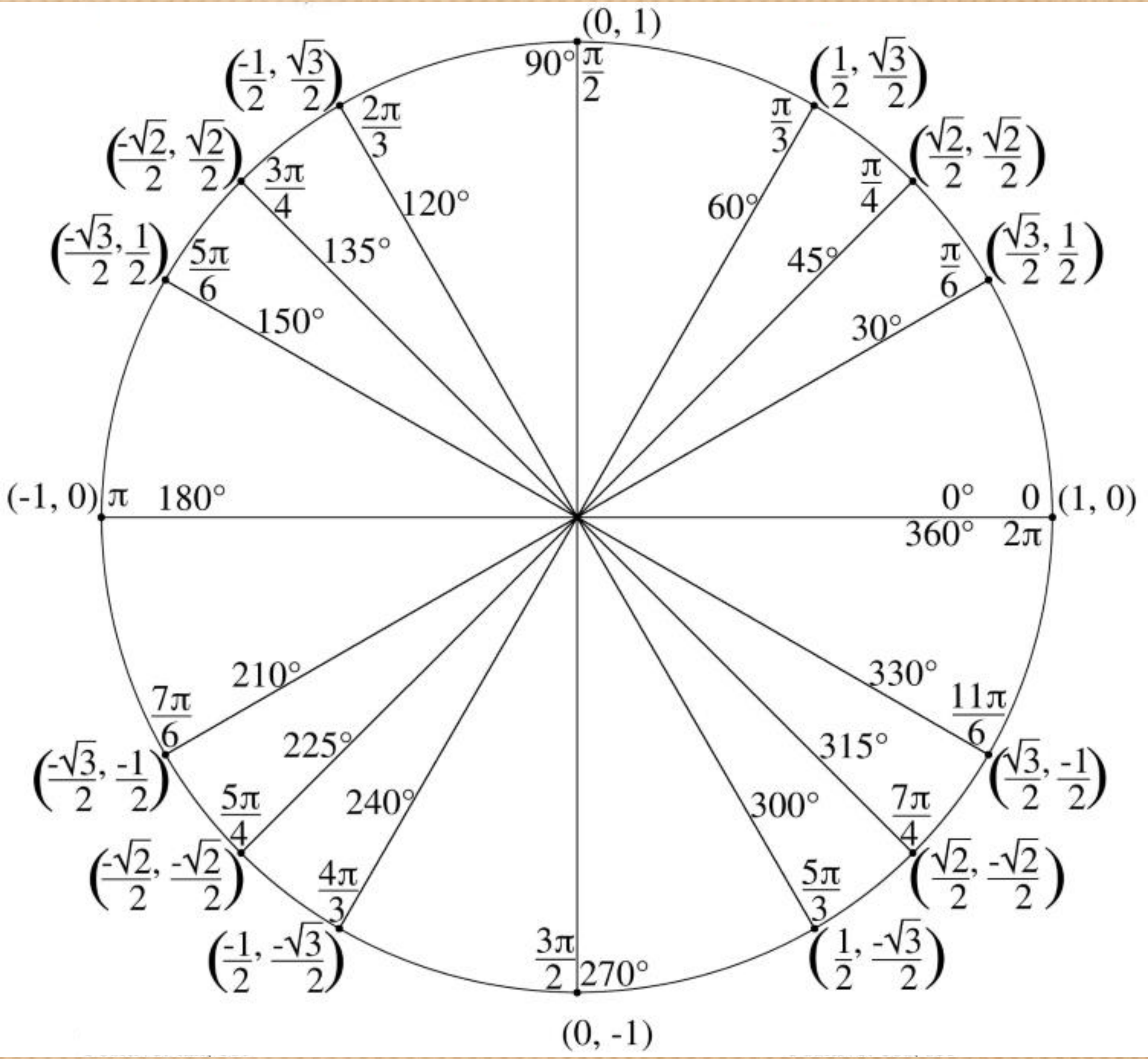
Use 1,2,3 1,2,3 square root to complete the numerators.

Use boxes to complete the other quadrants.



Unit Circle Quiz

Swap and Check



Remember to try these approaches when you are verifying identities or simplifying expressions…

Put the expression in terms of sine and cosine

Split fractions with a single term denominator by distributing the denominator to each term in the numerator.

Combine fractions with different denominators by finding a common denominator.

Practice is THE ONLY WAY you get better at these!

The trigonometric functions are PERIODIC functions.

pe·ri·od·ic func·tion

/ˌpirēädik ˈfəNGkSH(ə)n/

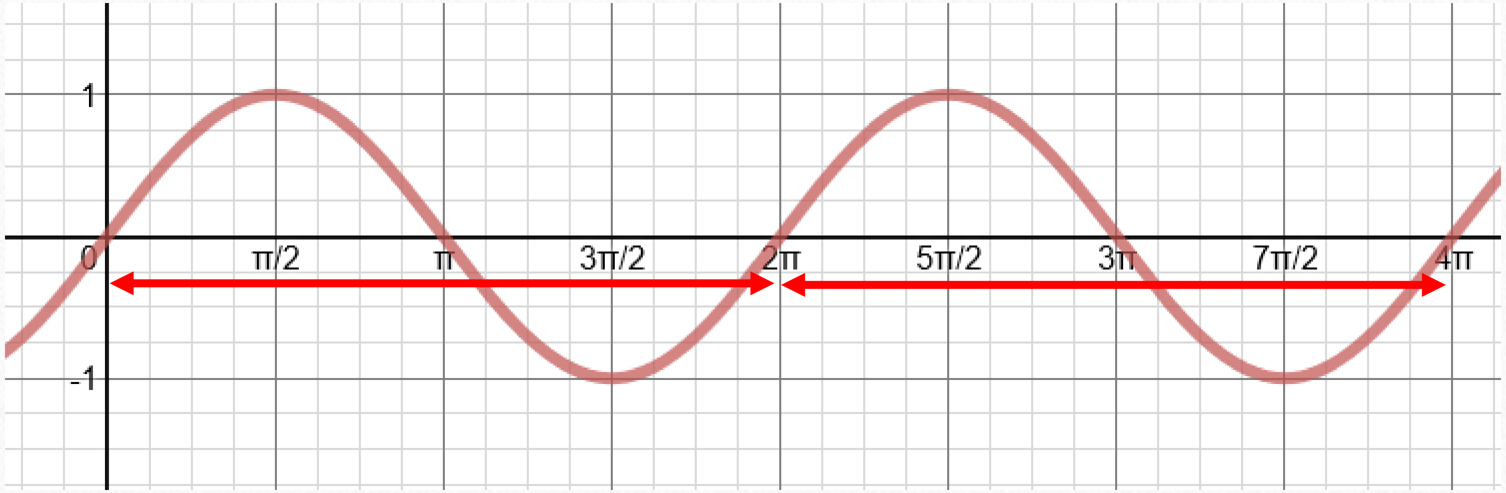
noun MATHEMATICS

plural noun: **periodic functions**

a function returning to the same value at regular intervals.

Starting at the origin, how long does it take this function to complete a **cycle** on the x axis?

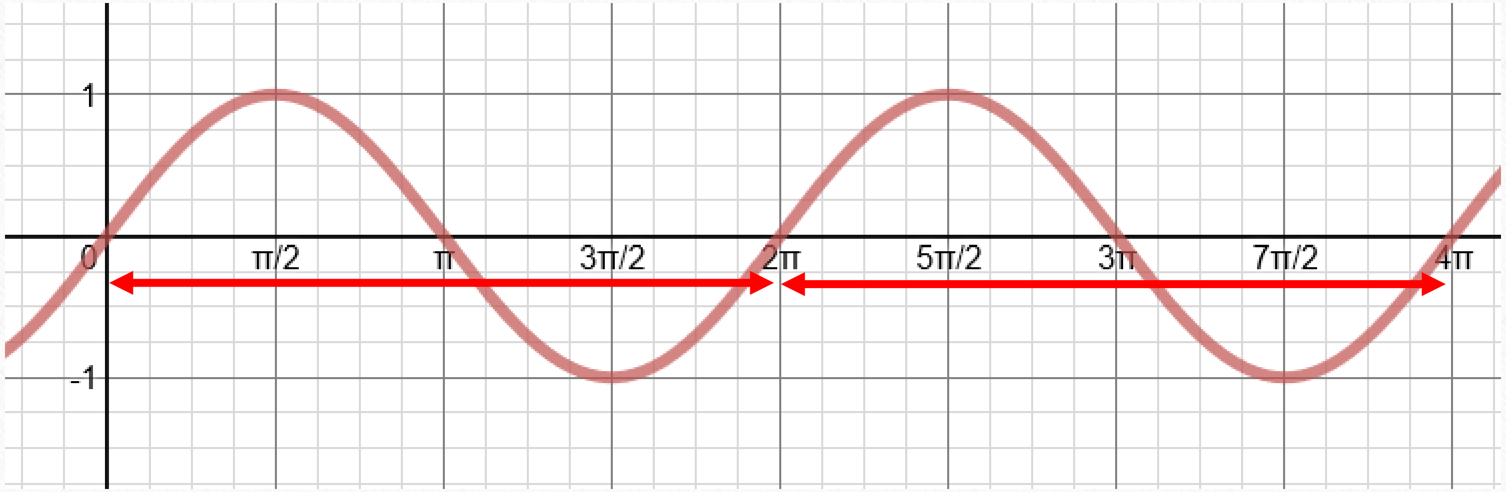
2π



Where on the x axis does the **next cycle** end?

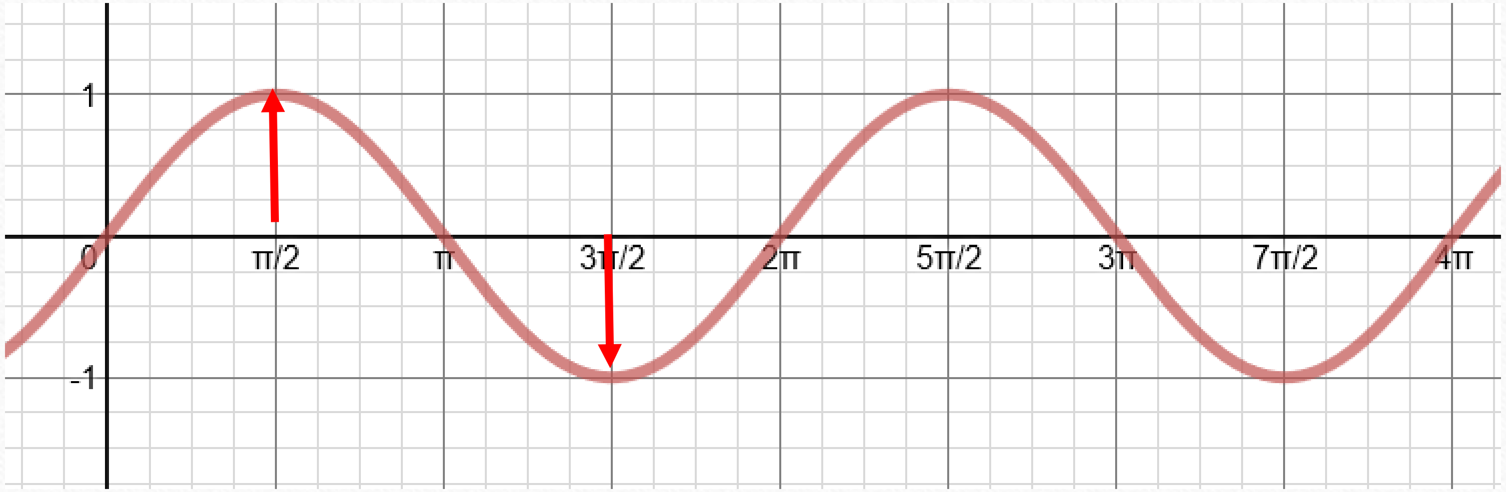
4π

We call the length of one cycle the Period of the function.



So what is the period of this function? **2π**

The **amplitude** of the graph is one half the distance between the maximum and minimum value in one period.

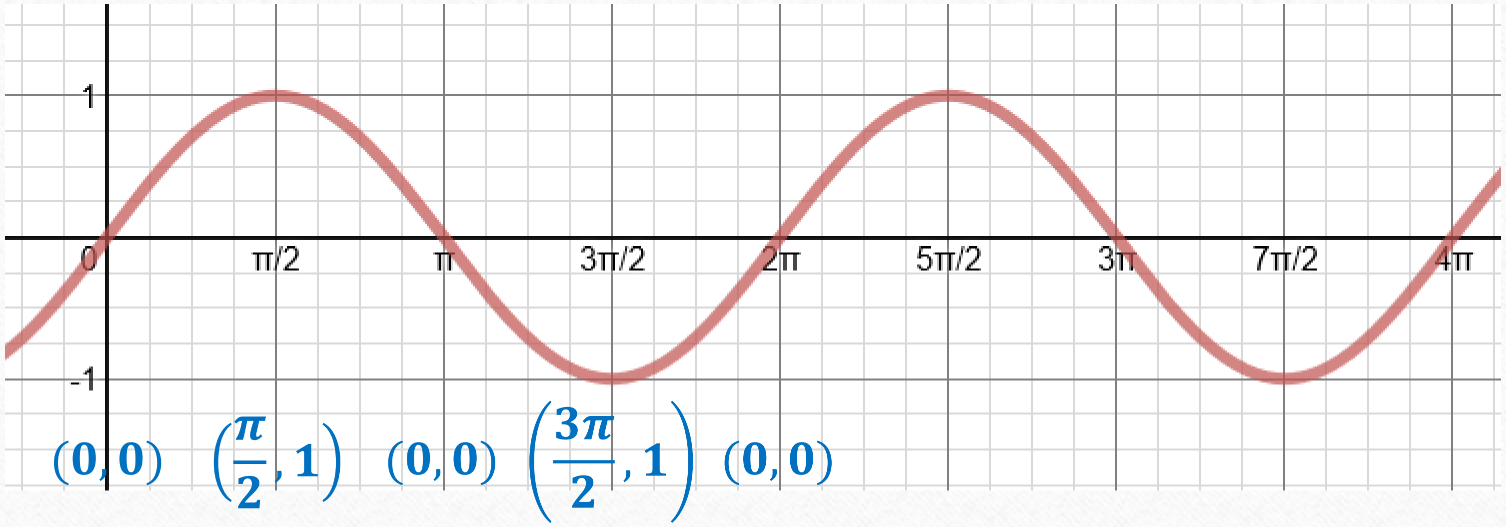


So what is the amplitude of this function? $\frac{1-(-1)}{2}=1$

Relate this graph to your Unit Circle

What are the y values of this function at the x values of $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$?

What function does this graph represent?



Looking at your unit circle…

What do you think the **x** values represent? Angle measures in radians

What do you think the **y** values represent? *y* values on the unit circle

Relate this graph to your Unit Circle

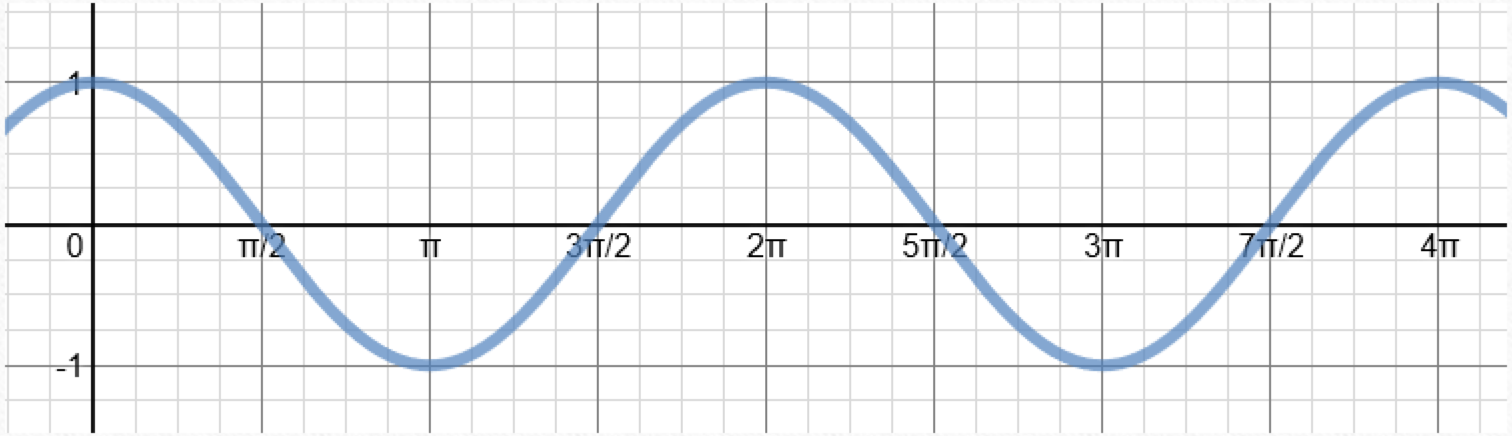
This is the Sine function!

$$y = \sin(x)$$

where x is equal to an angle measure and y is equal to the **sine** of the angle measure.

Can you guess what this graph this is?

Cosine

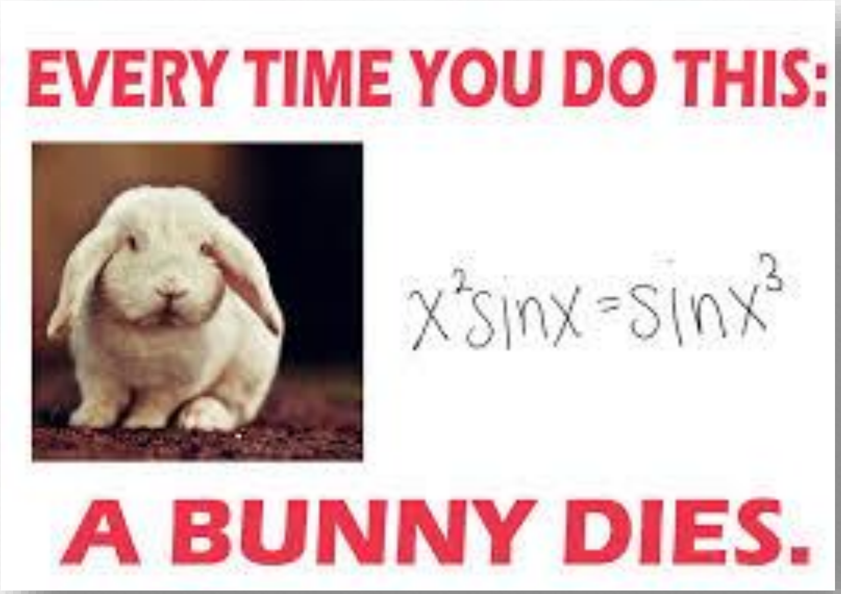


$$y = \cos(x)$$

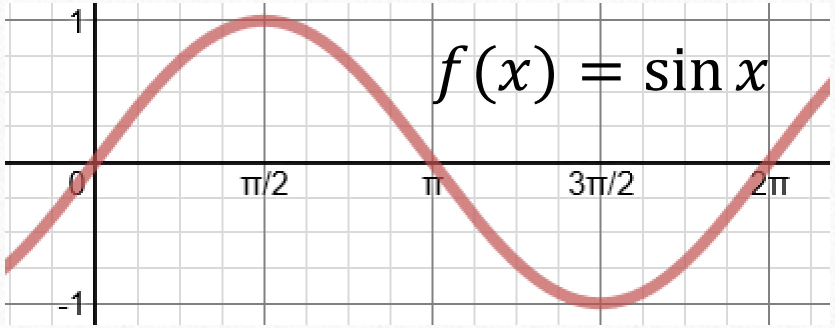
where x is equal to an angle measure and y is equal to the **cosine** of the angle measure.

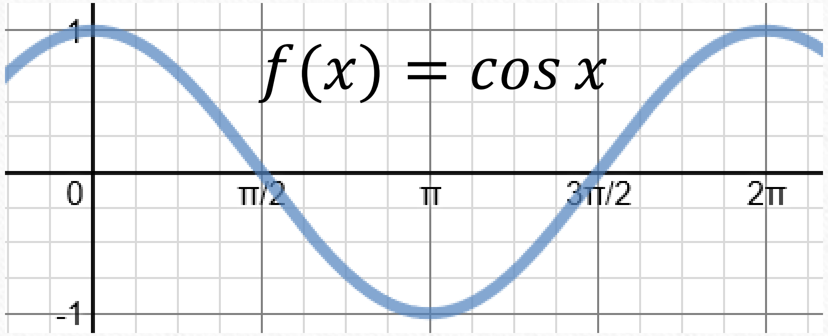
Trig Graphs are pretty cool…

Best Site for Trig Illustrations Ever



Compare the graphs of **sine** and **cosine**





Period: 2π Amplitude: 1

$$f(0) = 0$$
$$f\left(\frac{\pi}{2}\right) = 1$$
$$f(\pi) = 0$$
$$f\left(\frac{3\pi}{2}\right) = -1$$
$$f(2\pi) = 0$$

Period: 2π Amplitude: 1

$$f(0) = 1$$
$$f\left(\frac{\pi}{2}\right) = 0$$
$$f(\pi) = -1$$
$$f\left(\frac{3\pi}{2}\right) = 0$$
$$f(2\pi) = 1$$

Just like all the other functions we've looked at this semester, the parent sine and cosine functions can be **shifted left, right, up and down**. We can also **stretch and compress** these functions.

take note

Concept Summary **Families of Sine and Cosine Functions**

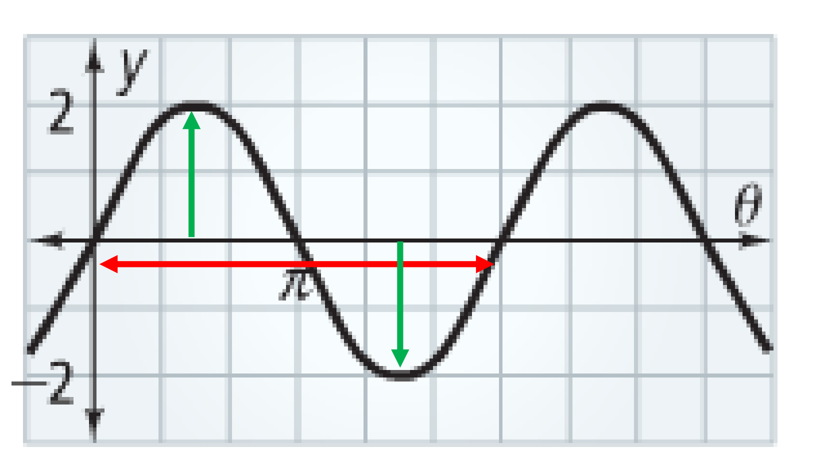
Parent Function	Transformed Function
$y = \sin x$	$y = a \sin b(x - h) + k$
$y = \cos x$	$y = a \cos b(x - h) + k$

- $|a|$ = amplitude (vertical stretch or shrink)
- $\frac{2\pi}{b}$ = period (when x is in radians and $b > 0$)
- h = phase shift, or horizontal shift
- k = vertical shift

Notice we have a new name for a horizontal shift.

The equation for the midline is $y = k$

Find the period and amplitude for following **sine** curve.



Period: 2π

Amplitude: 2

Write the equation of the function. $y = 2\sin x$

No horizontal or vertical shift since function is centered around the x axis and $f(0) = 0$.

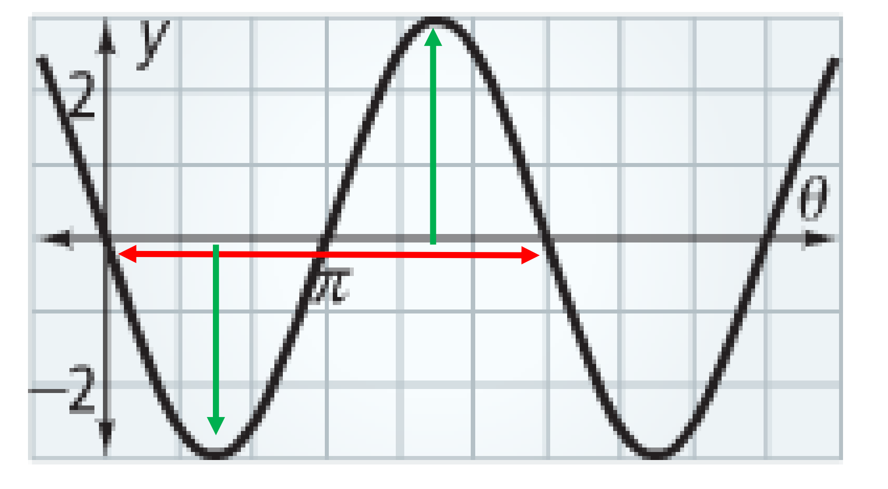
$2\pi = \frac{2\pi}{b}$ So $b = 1$ $y = 2\sin 1(x - 0) + 0$

Remember

$y = a\sin b(x - h) + k$

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

Find the period and amplitude for following **sine** curve.



Period: 2π

Amplitude: 3

What's different about this sine curve? **It's flipped.**

How do we deal with functions flipped over the x axis?

We put a negative in front of a.

Write the equation of the function. $y = -3\sin x$

No **horizontal** or **vertical** shift since function is centered around the x axis and $f(0) = 0$.

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

So $b = 1$

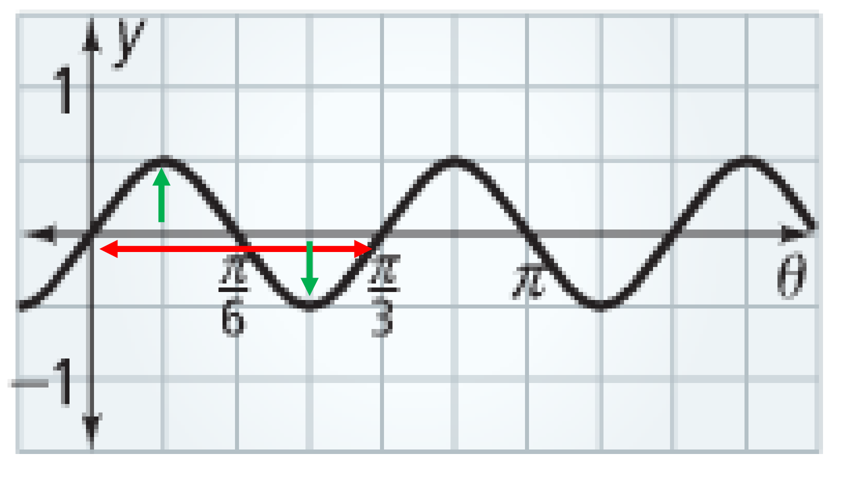
$y = -3\cos 1(x - 0) + 0$

Remember

$y = a\cos b(x - h) + k$

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

Find the period and amplitude for following **sine** curve.



Period: $\frac{\pi}{3}$

Amplitude: $\frac{1}{2}$

Write the equation of the function. $y = \frac{1}{2}\sin 6x$

No **horizontal** or **vertical** shift since function is centered around the x axis and $f(0) = 0$.

$\frac{\pi}{3} = \frac{2\pi}{b}$

So $b = 6$

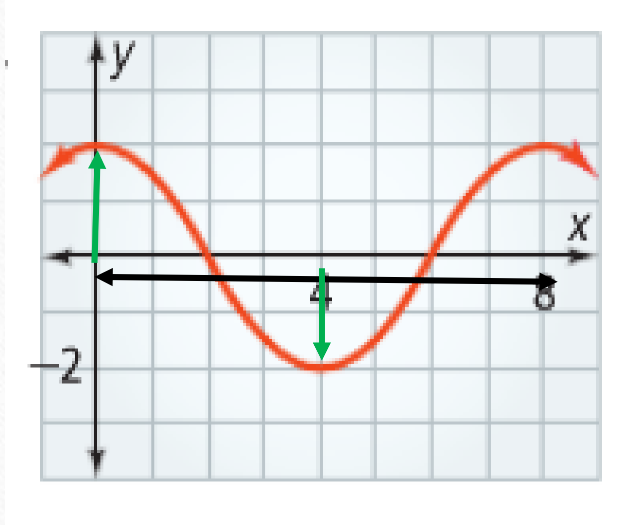
$y = \frac{1}{2}\sin 6(x - 0) + 0$

Remember

$y = a \sin b(x - h) + k$

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

Find the period and amplitude for following **cosine** curve.



Period: **8**

Amplitude: **2**

Write the equation of the function. $y = 2\cos\frac{\pi}{4}x$

No **horizontal** or **vertical** shift since function is centered around the x axis and $f(0)$ is a max or min.

$8 = \frac{2\pi}{b}$

So $b = \frac{1}{4}\pi$

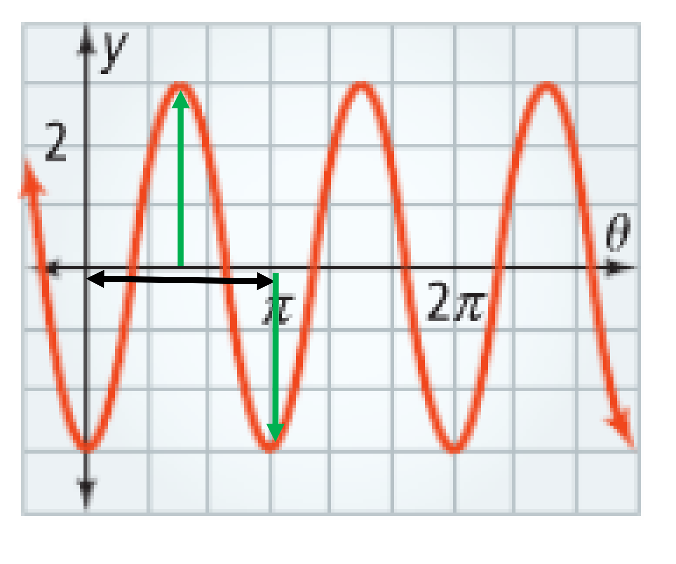
$y = 2\cos\frac{1}{4}\pi(x - 0) + 0$

Remember

$y = a\cos b(x - h) + k$

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

Find the period and amplitude for following **cosine** curve.



Period: π

Amplitude: **3**

What's different about this cosine curve? **It's flipped.**

How do we deal with functions flipped over the x axis?

We put a negative in front of a.

Write the equation of the function. $y = -3\cos 2x$

No **horizontal** or **vertical** shift since function is centered around the x axis and $f(0)$ is a max or min.

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

So $b = 2$

$y = -3\,cos\,2(x - 0) + 0$

Remember

$y = a\cos b(x - h) + k$

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

Identify period and amplitude for each of the following functions.

1\. $y = 2\sin \pi\theta$

Amplitude: **2**

Period: **2**

$b = \pi$

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

Remember

$y = a\cos b(x - h) + k$

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

2\. $y = -3\,cos\,4\theta$

Amplitude: **3**

Period: $\frac{\pi}{2}$

$b = 4$

$period = \frac{2\pi}{4} = \frac{\pi}{2}$

Write a **sine** function with the amplitude and period indicated.

1. amplitude 2, period $\frac{2\pi}{3}$
2. amplitude $\frac{1}{3}$, period π
3. amplitude 4, period 4π

Work on your homework problems.

If you finish them in class I will add one point to your trig unit test.

Make sure I initial your work book page.