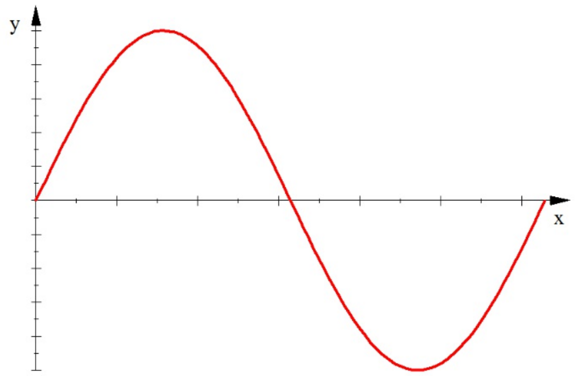
The Parent Function: $y = \sin x$



Period= 2π

Amplitude= 1

Eq of Midline: $y = 0$

$y = a\sin bx + k$

$|a|$ = Amplitude

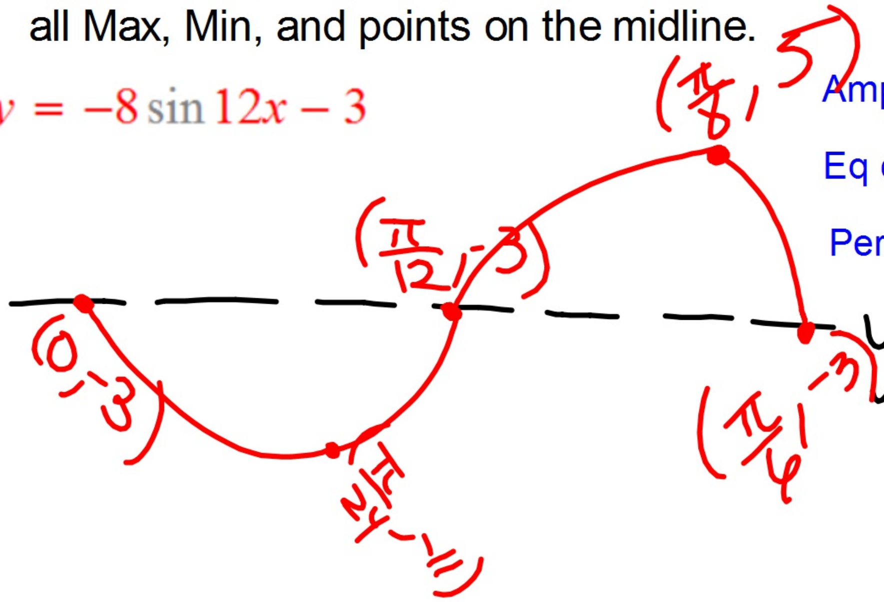
$a<0$ represents an x-axis reflection (upside down)

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

k: Vertical Translation (midline: $y=k$)

1. Sketch one period of this Sine function. Label the coordinates of all Max, Min, and points on the midline.

$y = -8\sin 12x - 3$

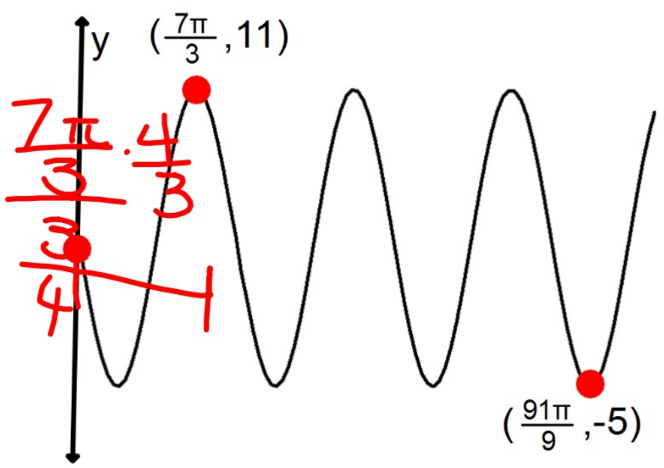


Amplitude = 8

Eq of Midline: $y = -3$

Period = $\frac{2\pi}{12}$ $\frac{\pi}{6} \cdot \frac{1}{4}$ $\frac{\pi}{24}$

2. Write the equation of this sine graph.



Amplitude = 8

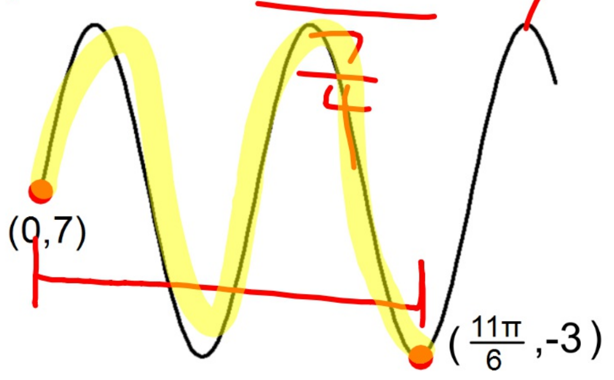
Eq of Midline: $y = 3$ $\frac{11 + -5}{2}$

Period = $\frac{2\pi}{\frac{28\pi}{9}}$ $b = \frac{9}{14}$

EQ: $y = -8\sin\left(\frac{9x}{14}\right) + 3$

3. Write the equation of this sine graph.

$\text{period} = \frac{\frac{11\pi}{6}}{\frac{7}{4}} = \frac{11\pi}{6} \cdot \frac{4}{7} = \frac{22\pi}{21}$



Amplitude = 10

Eq of Midline: $y = 7$

Period = $\frac{2\pi}{\frac{22\pi}{21}}$ $\quad b = \frac{21}{11}$

EQ:

$y = 10\sin\left(\frac{21}{11}x\right) + 7$

$$y = a\text{Sin}(b(x-h)) + k$$

a → Amplitude - Vert strecth or shrink.
Also x-axis reflection if negative

b → Leads to the Period = 2π/b - Horiz stretch or shrink

h → Horiz translation - Phase Shift

k → Vert translation - Eq of the Midline

Sketch one period of the graph of

$$y = -11\sin(4(x - \frac{3\pi}{4})) + 5$$

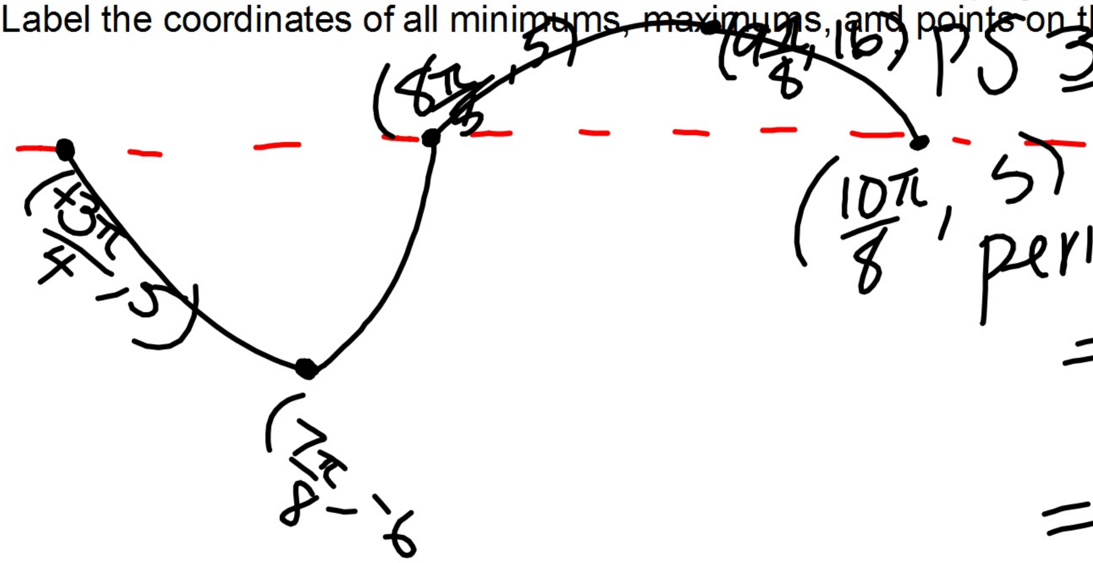
- A = 11
- upside down
- midline y=5

PS $\frac{3\pi}{4}$ Rt

y=5

period $\frac{2\pi}{4}$ $= \frac{\pi}{2} \cdot \frac{1}{4}$ $= \frac{\pi}{8}$

Label the coordinates of all minimums, maximums, and points on the midline.



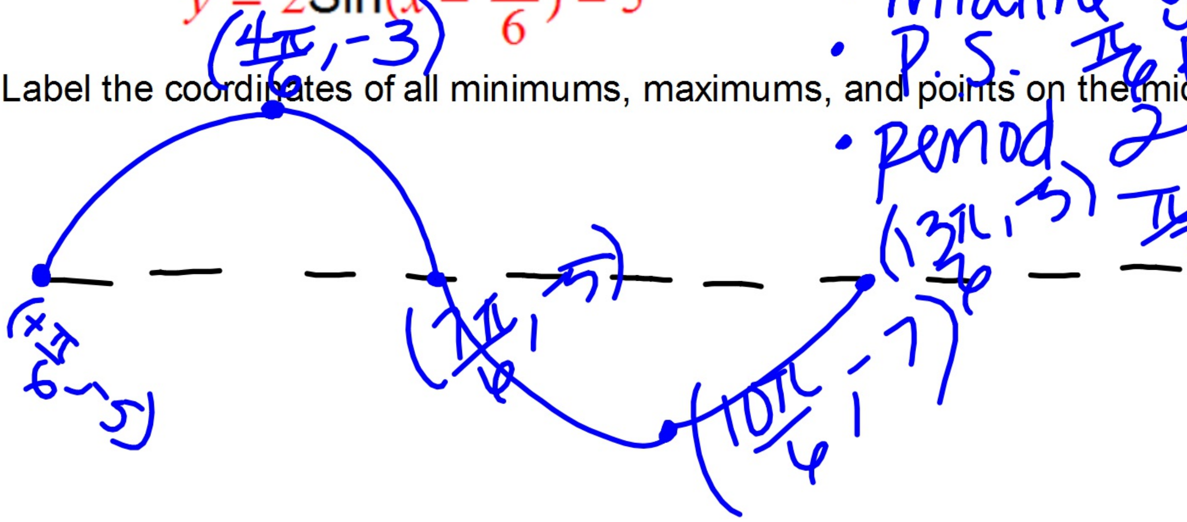
Sketch one period of the graph of

$$y = 2\text{Sin}(x - \frac{\pi}{6}) - 5$$

- Amp 2
- midline y=-5
- P.S. π/6 R.t.
- period 2π · 1/4 π/2

y=-5

Label the coordinates of all minimums, maximums, and points on the midline.



1. Coordinates of points on the Sine Function are graphed below in red.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Sinθ	0	0.71	1	0.71	0	−0.71	−1	−0.71	0	0.71	1	0.71	0	−0.71	−1	−0.71	0

2. Fill out the table for Cos (round decimals to the nearest hundredth) and plot on the same graph as the Sine Function.

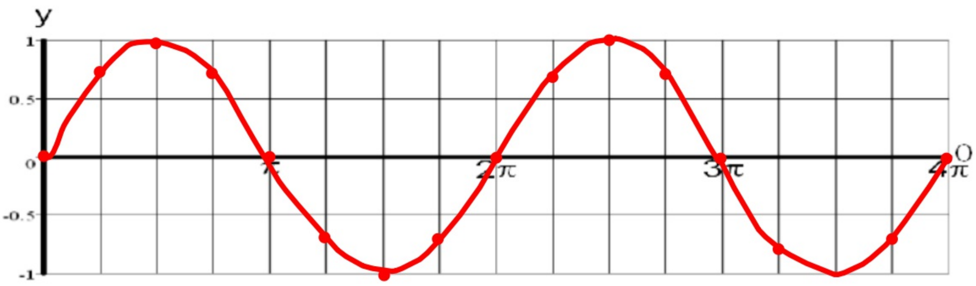
θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Cosθ																	

1. Coordinates of points on the Sine Function are graphed below in red.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Sinθ	0	0.71	1	0.71	0	−0.71	−1	−0.71	0	0.71	1	0.71	0	−0.71	−1	−0.71	0

2. Fill out the table for Cos (round decimals to the nearest hundredth) and plot.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Cosθ	1	0.71	0	-0.71	-1	-0.71	0	0.71	1	0.71	0	-0.71	-1	-0.71	0	0.71	1

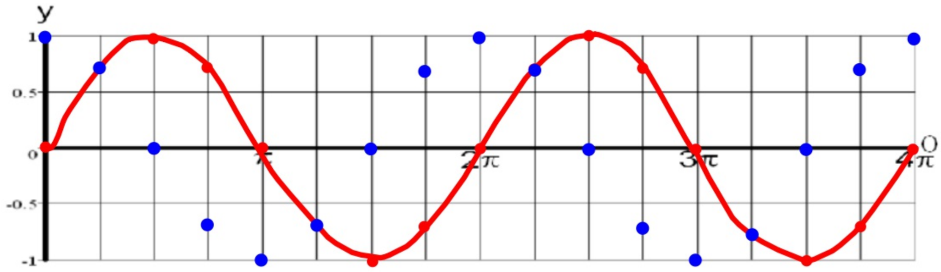


1. Coordinates of points on the Sine Function are graphed below in red.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Sinθ	0	0.71	1	0.71	0	−0.71	−1	−0.71	0	0.71	1	0.71	0	−0.71	−1	−0.71	0

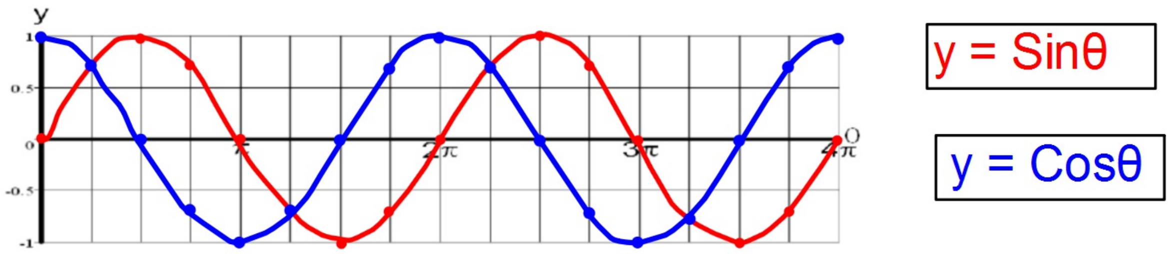
2. Fill out the table for Cos (round decimals to the nearest hundredth) and plot.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Cosθ	1	0.71	0	-0.71	-1	-0.71	0	0.71	1	0.71	0	-0.71	-1	-0.71	0	0.71	1



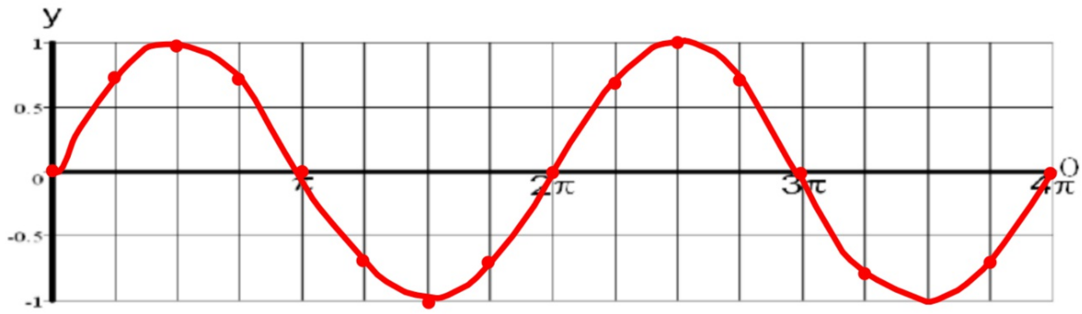
2. Fill out the table for Cos (round decimals to the nearest hundredth) and plot.

θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Cosθ	1	0.71	0	-0.71	-1	-0.71	0	0.71	1	0.71	0	-0.71	-1	-0.71	0	0.71	1



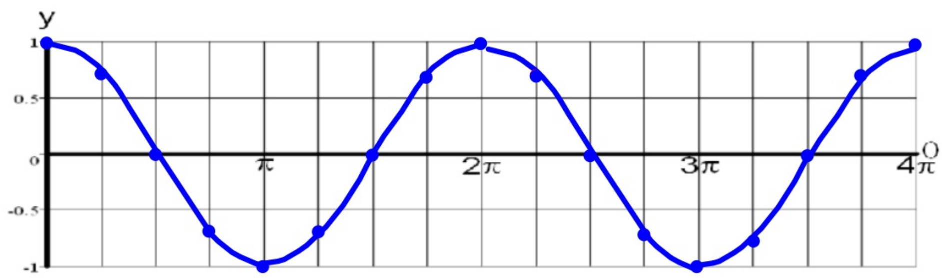
Period = 2π Amplitude = 1 Eq Midline: $y = 0$

The Parent Function: y = Sinx



Amplitude= 1 Eq of Midline: y = 0 Period= 2π

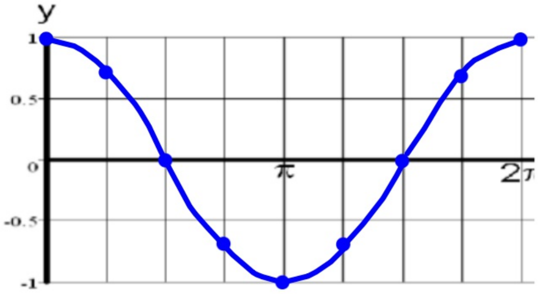
The Parent Function: y = Cosx



Amplitude= 1 Eq of Midline: y = 0 Period= 2π

One cycle of the parent Sine function looks like a sideways "S".

What does one period of the parent Cosine function look like?

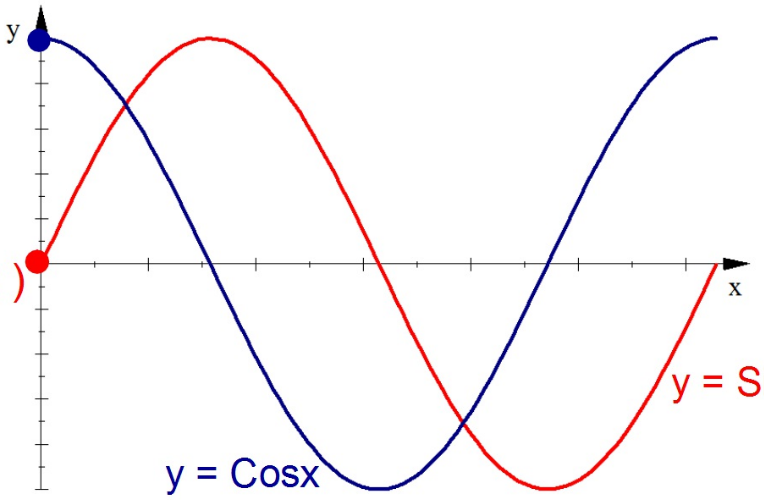


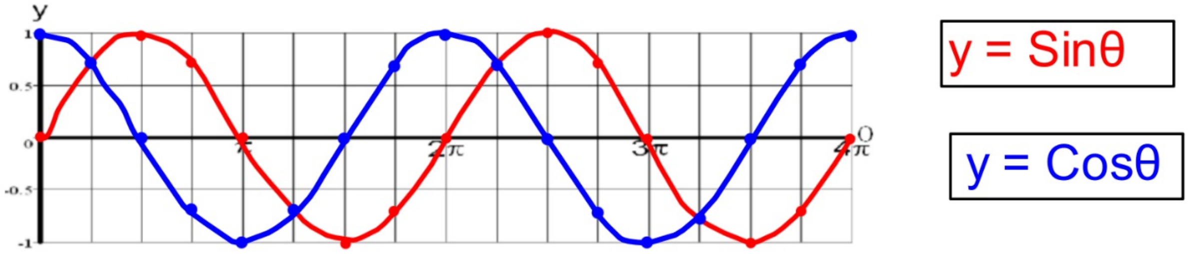
Looks similar to a
Parabola that opens up.

The "Starting Point" for the Parent Sine and Cosine Functions:

Cosine
(0 , 1)

Sine (0 , 0)

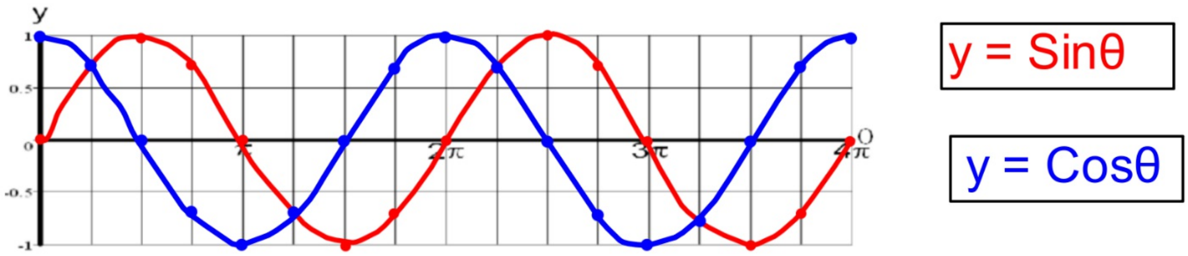




How are the graphs of Cosx and Sinx of the SAME?

They have the same Period, Amplitude, and Midline.

They also have the same shape.



How are the graphs of Cosx and Sinx of the DIFFERENT?

Where they start.

Section 13-5: The Cosine Function

A graph of the x-coordinates of the points as you move around the Unit Circle.

A graph of the horizontal distance to the right and left from the origin on the Unit Circle.

If you know the Sine Function, then

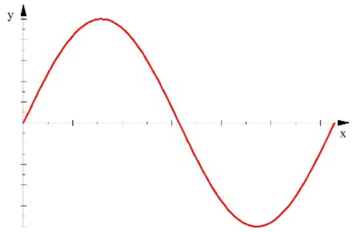
you know the Cosine Function!!

Starting points and direction for the Parent Functions.

y = Sinx
Starts on the midline then goes up.

y = Cosx
Starts at a maximum.

Y = aSin(b(x ± h)) ± k

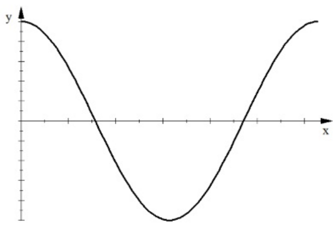


The starting point for the Parent Sine Function is:

on the Midline and goes Up as you move to the right

If you start on the Midline and go Down as you move to the right then the graph is upside down and a is negative in the equation.

Y = aCos(b(x ± h)) ± k



The starting point for the Parent Cosine Function is:

at a Maximum.

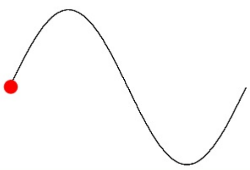
If you start at a Minimum
then the graph is upside down and a is negative in the equation.

Starting points for

y = aSin/Cosx

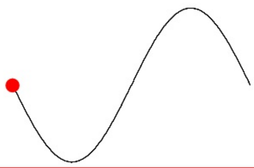
Sine Graphs

Positive a



Starts
on the Midline
and goes UP

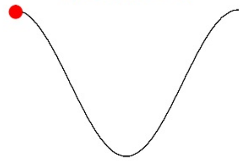
Negative a



Starts
on the Midline
and goes
DOWN

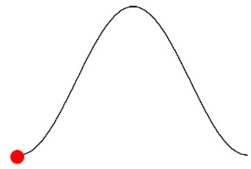
Cosine Graphs

Positive a

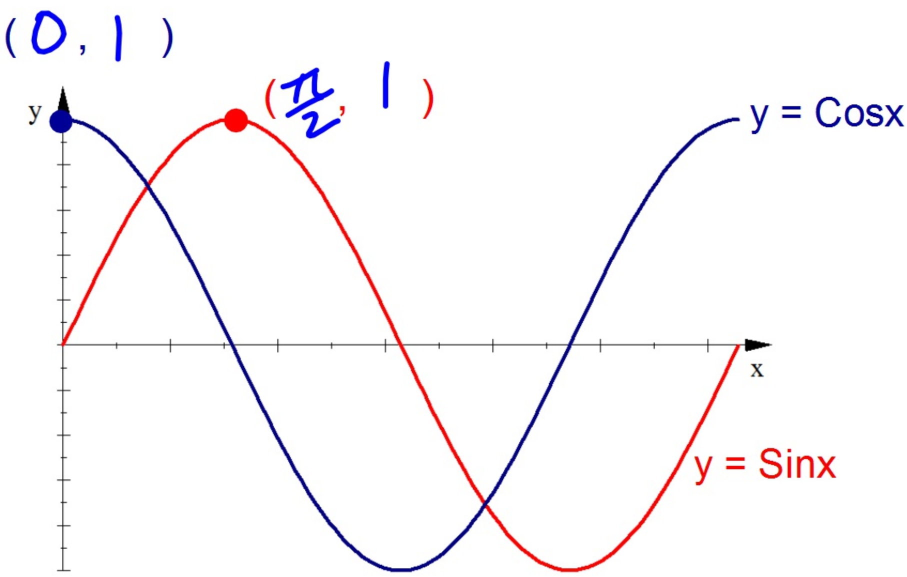


Starts
at a Max

Negative a



Starts
at a Min



ALSO

How else is the graph of Cosx related to the graph of Sinx?

They are horizontal translations of each other.

To get the Sinx you translate Cosx $\pi/2$ to the right
$\sin x = \cos(x - \pi/2)$

To get the Cosx you translate Sinx $\pi/2$ to the left
$\cos x = \sin(x + \pi/2)$

$y = a\sin bx$

a = Amplitude (vertical Stretch or Shrink factor)

a<0 is an x-axis reflection (upside down)

$$\text{Period} = \frac{2\pi}{b} \longrightarrow b = \frac{2\pi}{\text{Period}}$$

$y = a\cos bx$

a = Amplitude (vertical Stretch or Shrink factor)

a<0 is an x-axis reflection (upside down)

$\text{Period} = \frac{2\pi}{b}$ → $b = \frac{2\pi}{\text{Period}}$

Graph one period of this Cosine Function. Label the coordinates of all maximums, minimums, and pts on the midline.

$y = 10\cos 12x$