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

a = Vertical Stretch or Shrink Factor: $|a|$ = Amplitude
if $a<0$ x-axis reflection

h = Horizontal Translation — Phase Shift

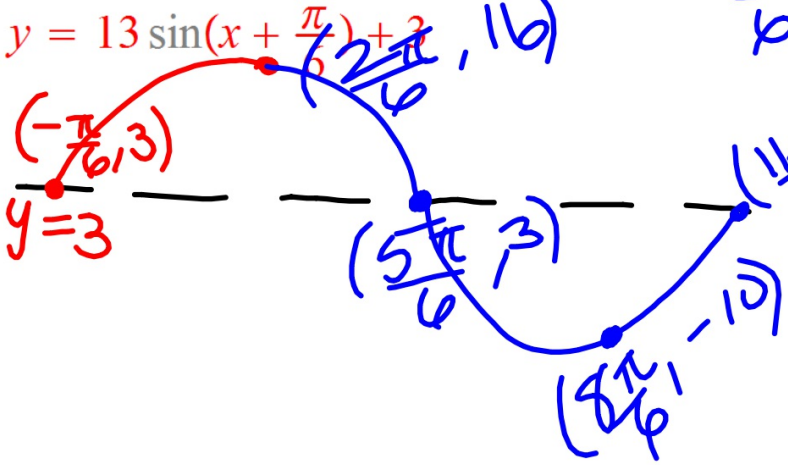
k = Vertical Translation — Midline: $y = k$

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

Starting Point: (h,k)

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

$y = 13\sin(x + \frac{\pi}{6}) + 3$



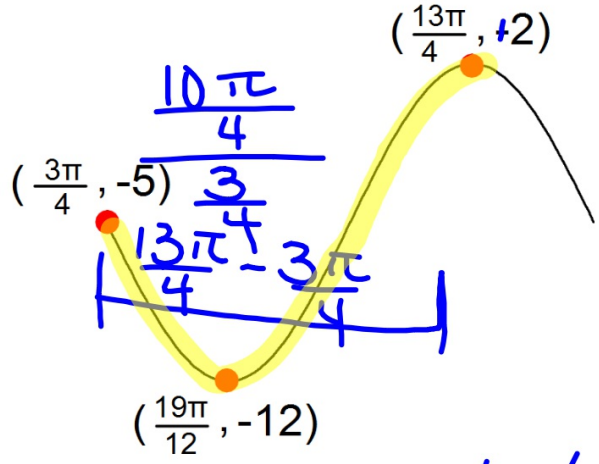
Amplitude = 13

Midline: $y = 3$

Phase Shift: $\frac{\pi}{6}$ left

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

2. Write the equation of this transformed Sine function.



Amplitude = 7

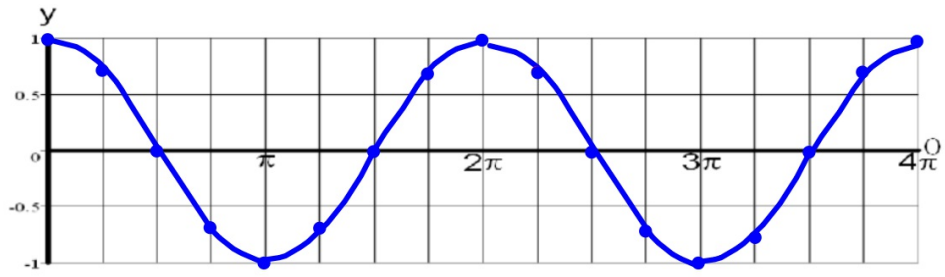
Midline: $y = -5$

Phase Shift: $\frac{3\pi}{4}$ rt

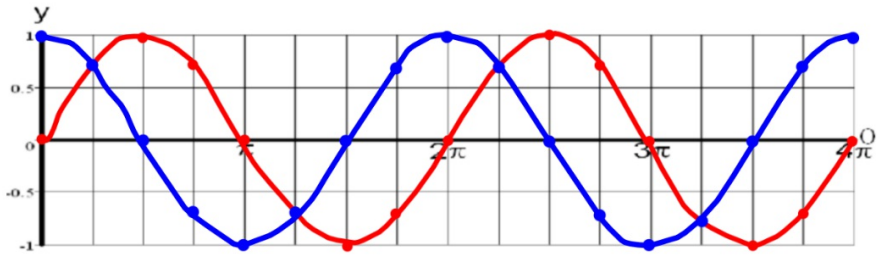
Period = $\frac{10\pi}{3} \Rightarrow \frac{2\pi}{\frac{10\pi}{3}} = \frac{3}{5}$

EQ: $y = -7\sin\left(\frac{3}{5}\left(x - \frac{3\pi}{4}\right)\right) - 5$

The Parent Function: y = Cosx



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



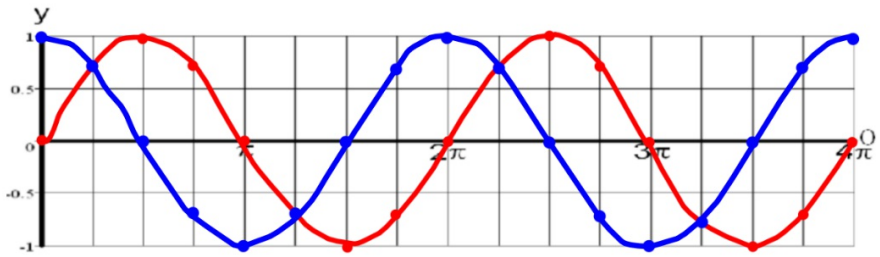
y = Sinθ

y = Cosθ

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.



y = Sinθ

y = Cosθ

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.

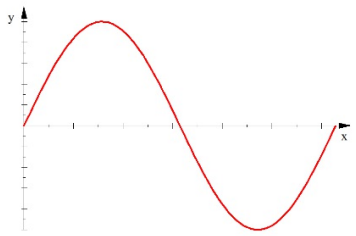
y = Sinx

Starts on the midline then goes up.

y = Cosx

Starts at a maximum.

$$Y = a\text{Sin}(b(x \pm h)) \pm k$$

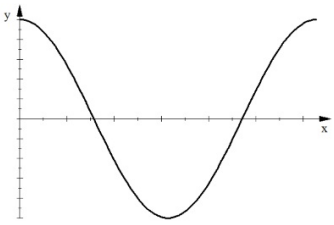


The starting point for the Parent Sine Function is:

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.

$Y = a\text{Cos}(b(x \pm h)) \pm k$



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.

$y = a\cos bx$

a = Amplitude (vertical Stretch or Shrink factor)

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

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

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

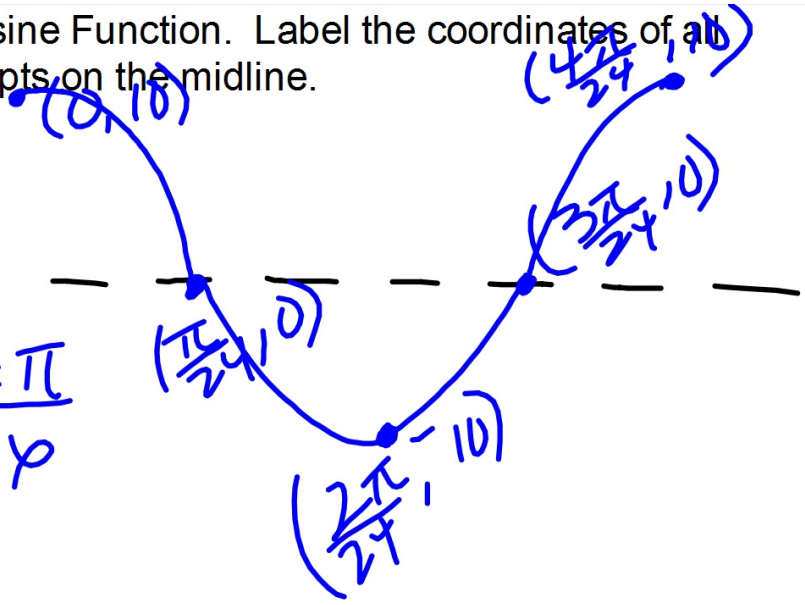
y = 10 Cos 12x

amp: 10

midline: y=0

period: $\frac{2\pi}{12} = \frac{\pi}{6}$

$\frac{\pi}{24}$

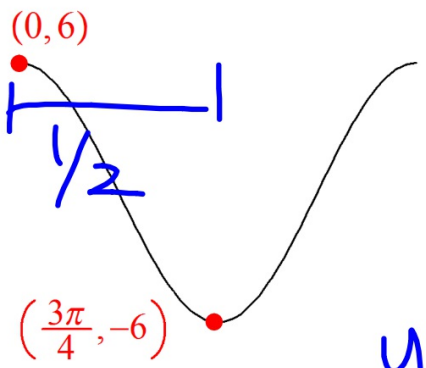


Write the equation of this Cosine Function.

EQ:

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

$\frac{1}{2}$



amp 6

midline $y=0$ $k=0$

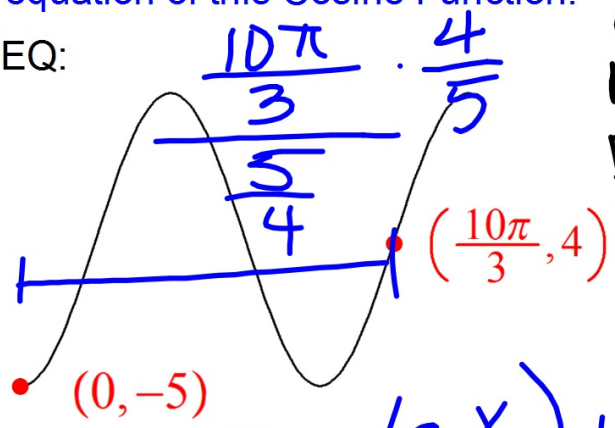
period $\frac{3\pi}{2}$ $\frac{2\pi}{\frac{3\pi}{2}} \cdot \frac{2}{3\pi}$

$b = \frac{4}{3}$

$y = 6\cos(\frac{4}{3}x)$

Write the equation of this Cosine Function.

EQ: $y = -9\cos\left(\frac{3x}{4}\right) + 4$



amp 9
midline $y = 4$
period $\frac{40\pi}{15} = \frac{8\pi}{3}$
$b = \frac{2\pi}{\frac{8\pi}{3}} = \frac{3}{4}$

Graph one period of: $y = -7\cos\left(\frac{x}{3}\right)$

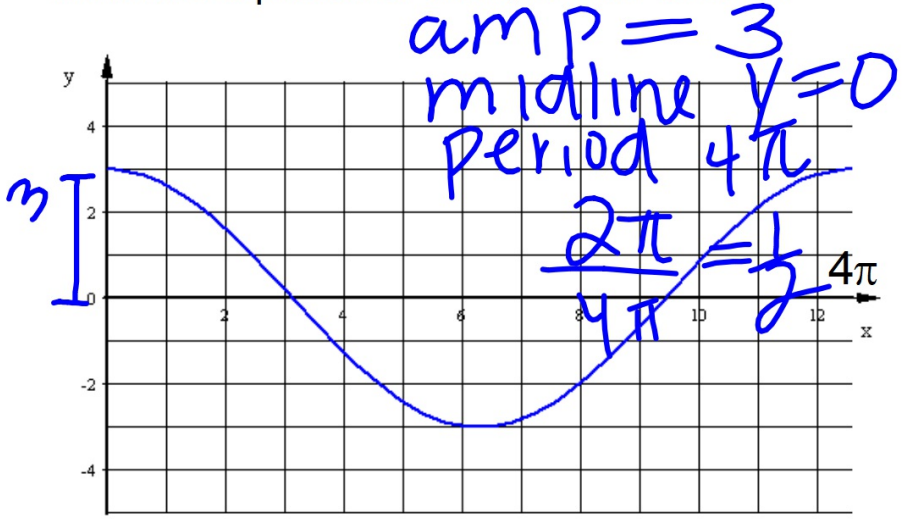
Label the coordinates of all x-intercepts, maximums, and minimums.

amp 7
midline $y = 0$
period $\frac{2\pi}{\frac{1}{3}} \cdot \frac{3}{1} = 6\pi$
1/4 of period $6\pi \cdot \frac{1}{4} = \frac{3\pi}{2}$

$(0, -7)$
$\left(\frac{3\pi}{2}, 0\right)$
$\left(\frac{6\pi}{2}, 7\right)$
$\left(\frac{9\pi}{2}, 0\right)$
$\left(\frac{12\pi}{2}, -7\right)$

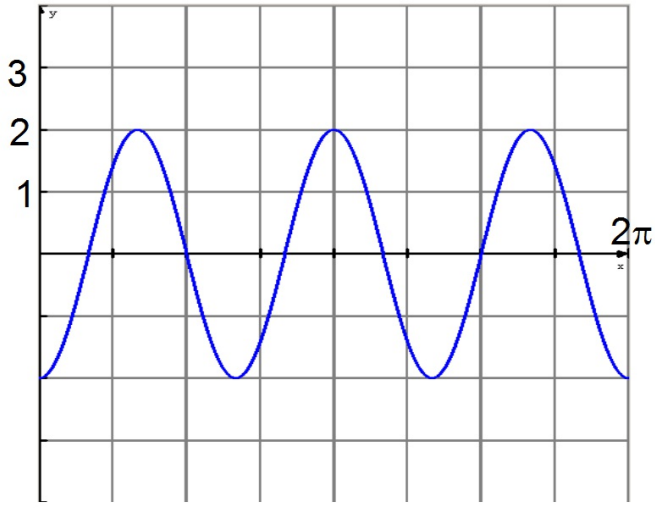
Write the equation of this Cosine Function.

y = 3Cos(x/2)



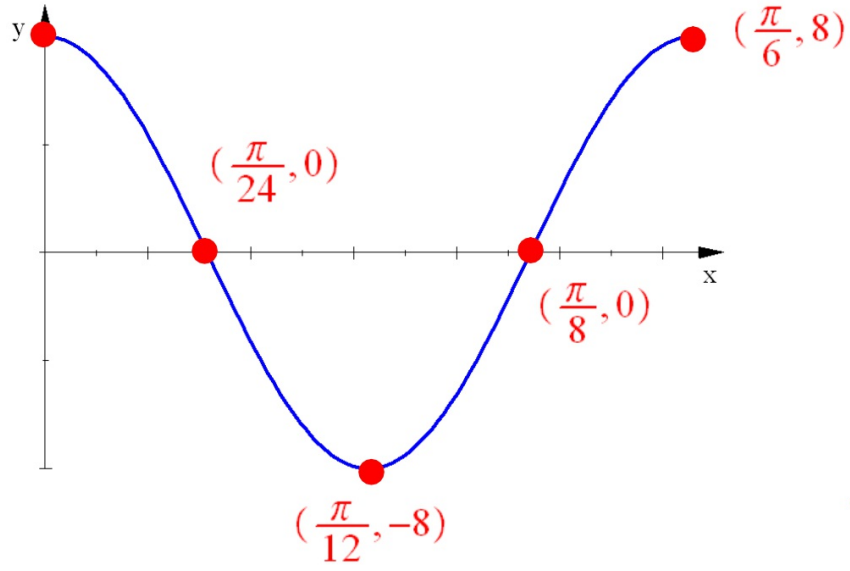
Write the equation of this Cosine Function.

y= -2Cos(3x)



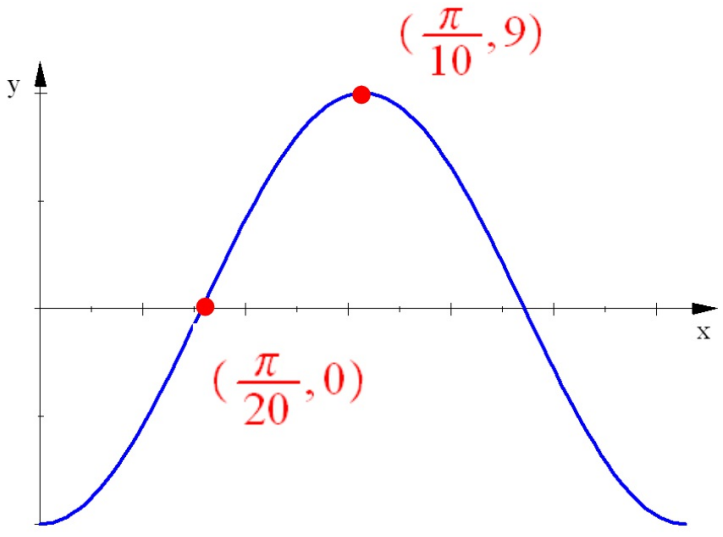
amp 2
period 2π/3
midline y=0
2π/(2π/3) · 3/2π = 3

Write the equation of this Cosine Function:



$y = 8\text{Cos}(12x)$

Write the equation of this Cosine Function:



$y = -9\text{Cos}10x$

You can now do Hwk #20

Sec 13-5

Practice Sheet