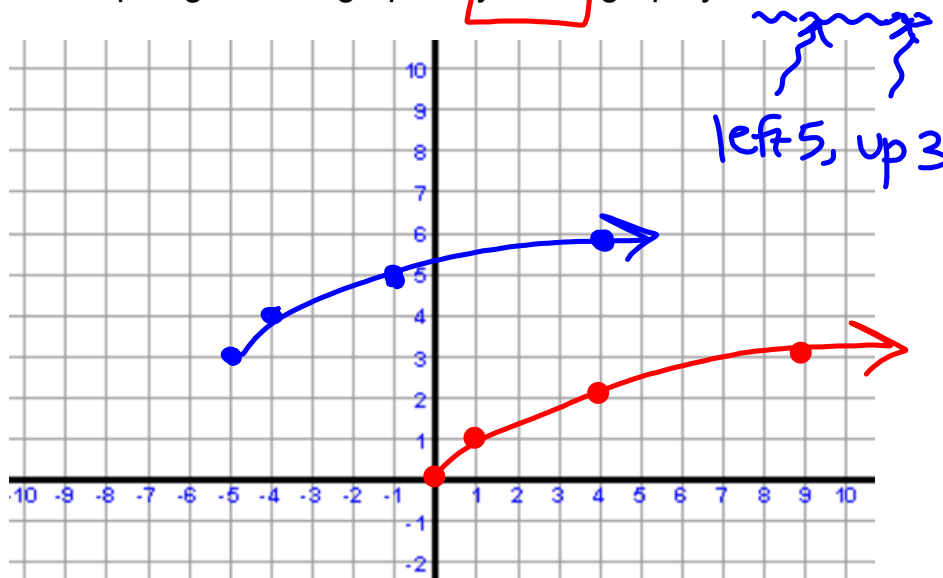


## 4.3 - Graphing Sin/Cos Trig. Functions - Day 4

**Essential Understanding** You can translate periodic functions in the same way that you translate other functions.

Today, we are introducing "Phase (*horizontal*) Shifts"

For example, given the graph of  $y = \sqrt{x}$ , graph  $y = \sqrt{x+5} + 3$



take note

### Concept Summary Families of Sine and Cosine Functions

Parent Function

$$y = \sin x$$

$$y = \cos x$$

Transformed Function

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

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

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

**Remember!**

*Its opposite sign movement  
for left and right!*

Find the amplitude, period and midline first. Set up the x and y axis next. Then graph, in radians, **using the entire coordinate plane**. Apply the shifts last.

$$y = 5 \sin\left(\theta - \frac{\pi}{2}\right)$$

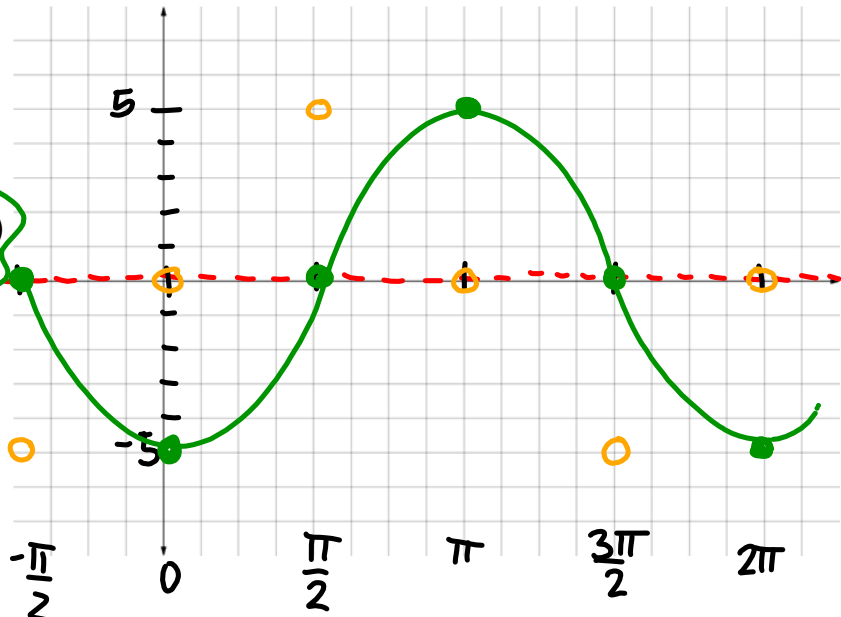
Amplitude = 5

Reflection? Yes / No (circle one)

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

Midline:  $y=0$

Right  $+\frac{\pi}{2}$  (4 units)



Find the amplitude, period and midline first. Set up the x and y axis next. Then graph, in radians, **using the entire coordinate plane**. Apply the shifts last.

$$y = -3 \cos\left(\theta + \frac{\pi}{4}\right) - 4$$

Amplitude = 3

Reflection? Yes / No (circle one)

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

Midline:  $y=-4$

Left  $+\frac{\pi}{4}$  (2 units)

