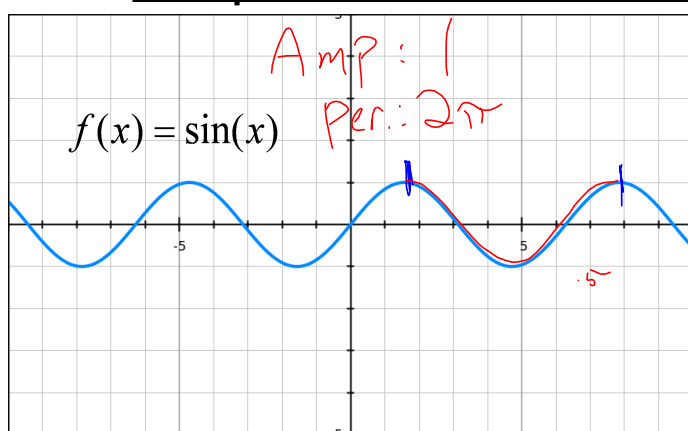


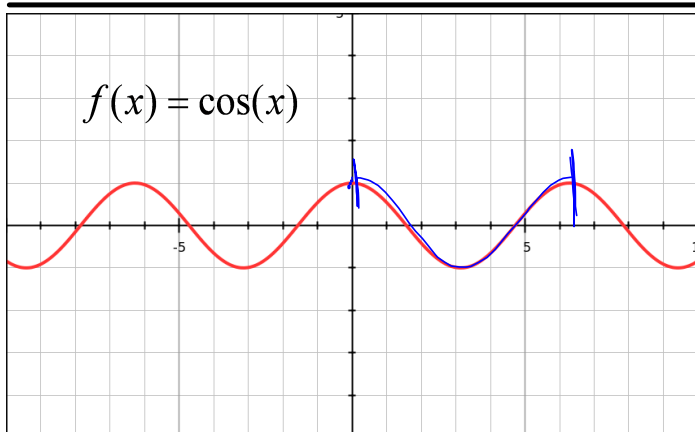
Sec 4.5

Graphs of the Sine and Cosine Functions

x-value $\frac{\pi}{2}$

Domain: All Real numbers
(radians or degrees)

Range: $-1 \leq y \leq 1$

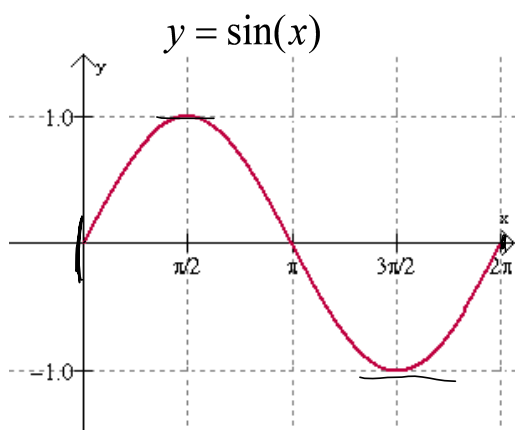


Domain: All Real numbers
(radians or degrees)

Range: $-1 \leq y \leq 1$

Characteristics of Trig Functions

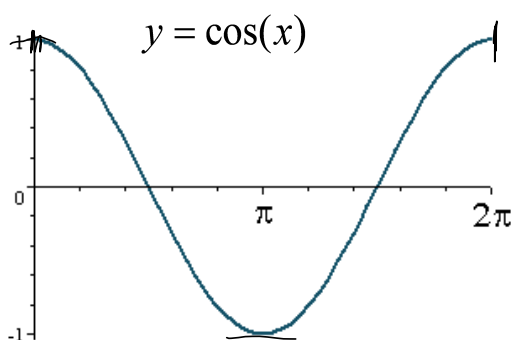
- all trig functions repeat themselves, the horizontal distance it takes for the graph to repeat itself is called the period.
- the sine and cosine functions have an amplitude. It is defined as half the distance between the maximum and minimum values.



For the basic sine function

period = 2π

amplitude = 1



For the basic cosine function

period = 2π

amplitude = 1

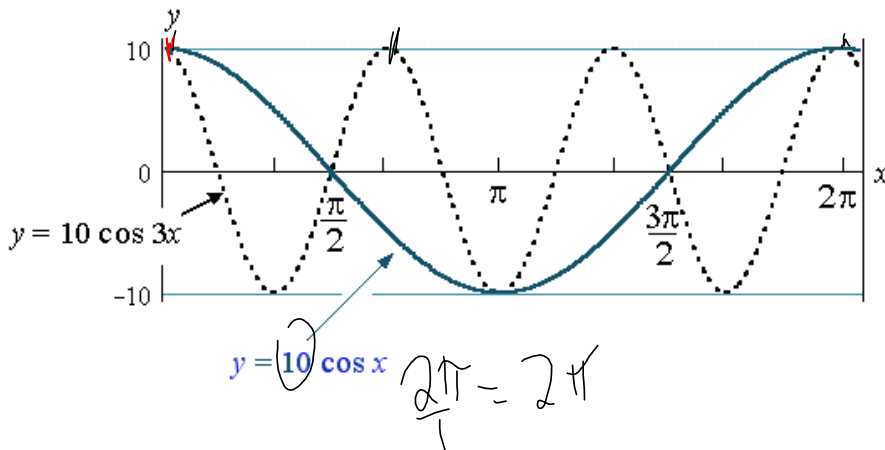
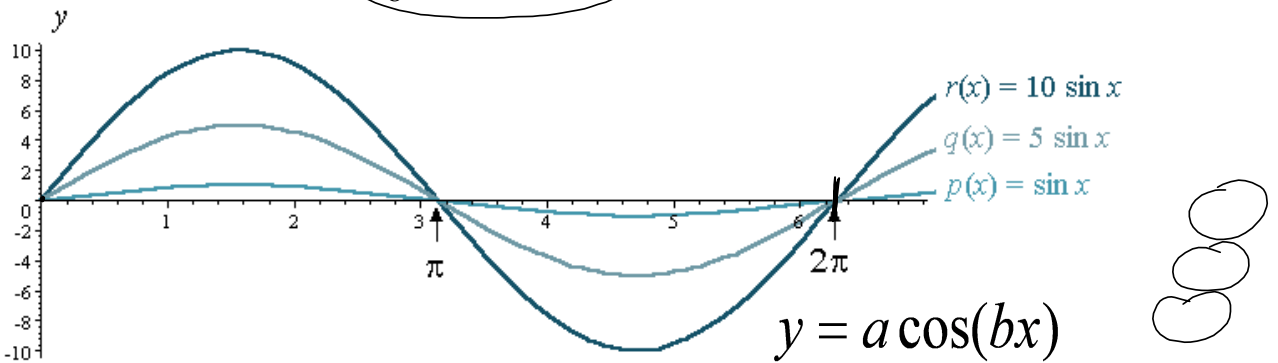
The sine & cosine graphs can be changed to any size wave by changing some things in the equation. Right now we are going to concentrate on amplitude and period.

$$y = a \sin(bx)$$

$|a| = \text{amplitude}$

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

$-4 \sin x$



go to applet page

Example Identify the amplitude and period from the equations

$$y = -4 \cos(4x)$$

amp : 4

Per : $\frac{2\pi}{4} = \frac{\pi}{2}$

$$y = a \cdot \cos(bx)$$

$a = -4$

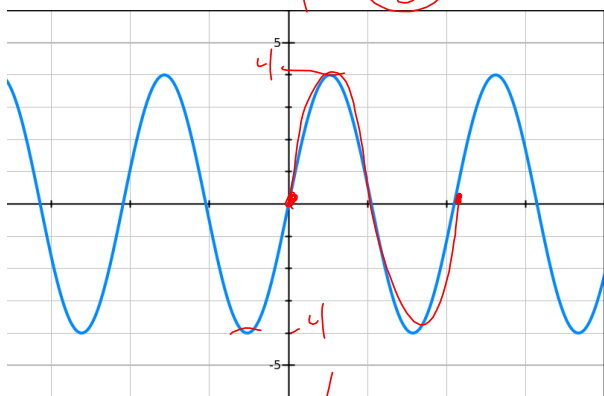
$b = 4$

$$y = \frac{1}{2} \sin\left(\frac{2\pi x}{3}\right)$$

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

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

Per : $\frac{2\pi}{\frac{2\pi}{3}} = 2\pi \cdot \frac{3}{2\pi}$



amp : 4

Per : 2.1

⊖

$\frac{2\pi}{b} = 2.1$

3

$$y = \sin\left(\frac{2\pi}{2.1} x\right)$$

Day 2 Start

The amplitude and period are stretches of the basic sine & cosine functions. A phase shift is a horizontal shift of a trig function.

$$y = d + a \sin(bx - c)$$

$$y = d + a \cos(bx - c)$$

- these variables do the same thing to the sine and cosine graphs

d = vertical shift \longrightarrow positive \Rightarrow shift up negative \Rightarrow shift down

$\frac{c}{b}$ = phase shift \longrightarrow you need to compare the equation to the generic above, when it is $bx - c$, shift right.
when it is $bx + c$, shift left

the left and right endpoints of a one-cycle interval can be found by solving the two equations

$$bx - c = 0 \quad \text{and} \quad bx - c = 2\pi$$

Example

Identify the amplitude, period, phase shift and vertical shift.

$$y = \frac{1}{2} \sin\left(x - \frac{\pi}{3}\right)$$

Write the equation that would produce this graph.

