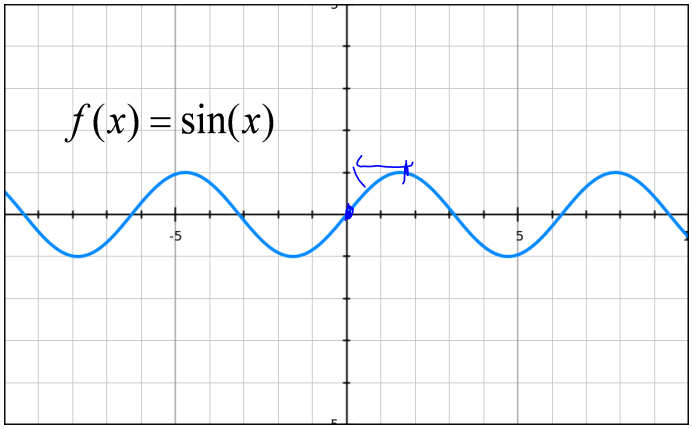
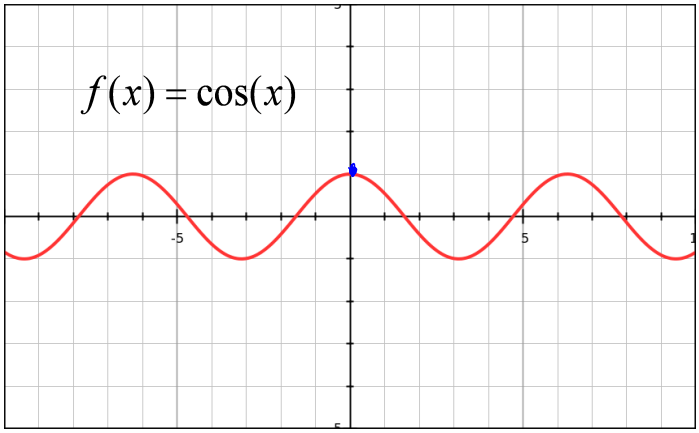
Sec 4.5
Graphs of the Sine and Cosine Functions



Domain: All Real numbers
(radians or degrees)

Range: $-1 \le y \le 1$



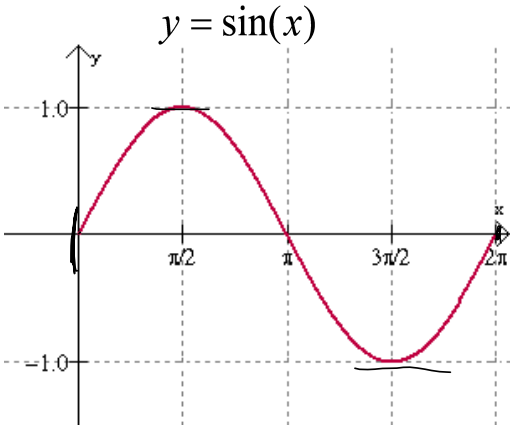
Domain: All Real numbers
(radians or degrees)

Range: $-1 \le y \le 1$

Characteristics of Trig Functions

- all trig functions repeat themselves, the horizontal distance it takes for the graph to repeat itself is called the period.

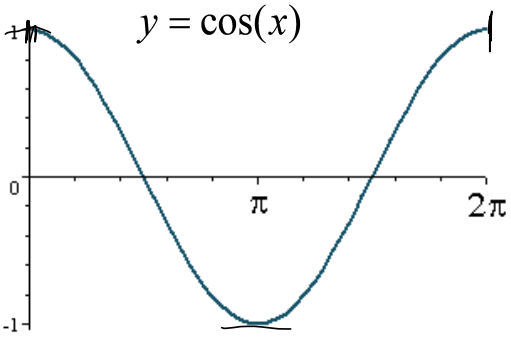
- the sine and cosine functions have an amplitude. It is defined as half the distance between the maximum and minimum values.



For the basic sine function

period = 2π

amplitude = 1



For the basic cosine function

period = 2π

amplitude = 1

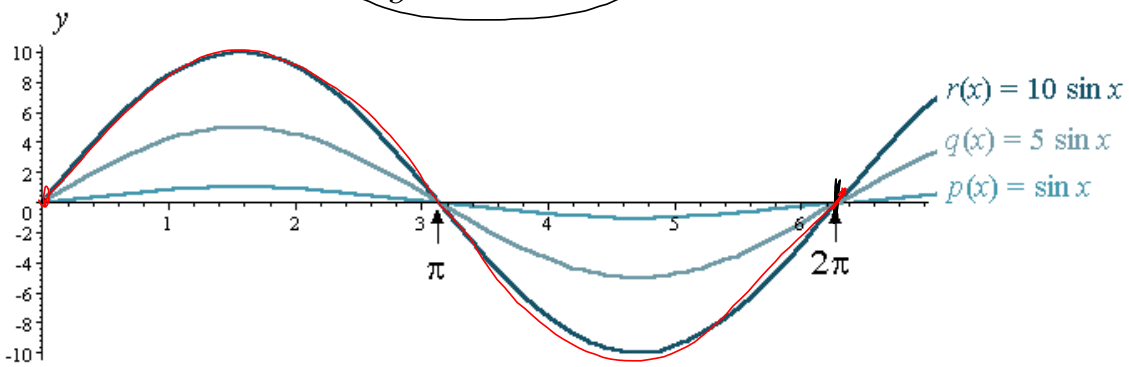
The sine & cosine graphs can be changed to any size wave by changing some things in the equation. Right now we are going to concentrate on amplitude and period.

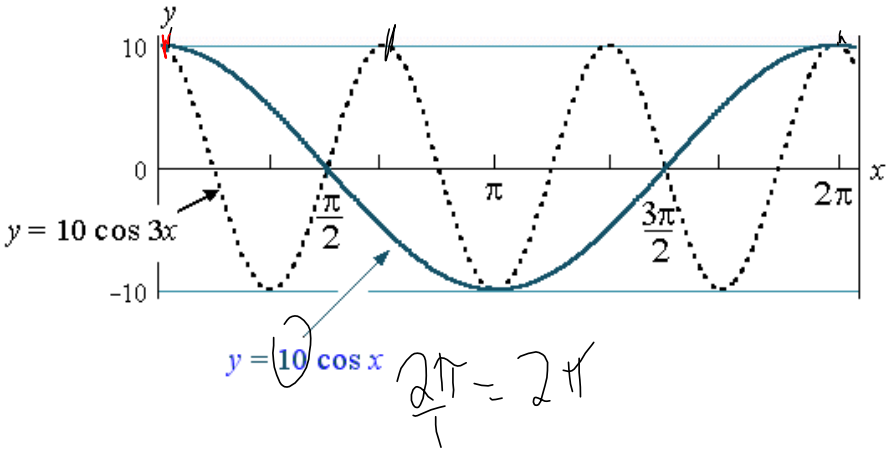
$y = a\sin(bx)$ $y = a\cos(bx)$

$|a|$ = amplitude

$-4\sin x$

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





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

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

go to applet page

Example Identify the amplitude and period from the equations

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

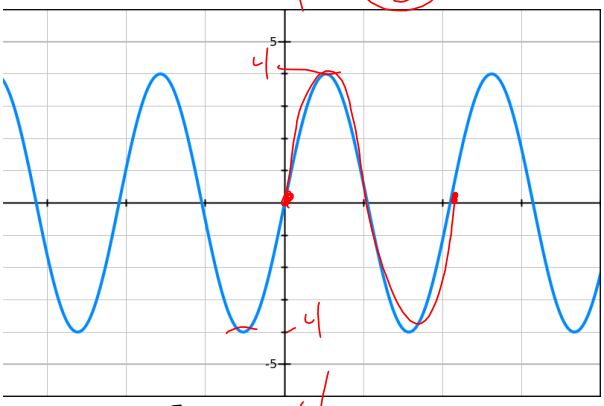
$y = a\cdot\cos(bx)$

amp : 4

$a = -4$

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

$b = 4$



Amp : 4

Per : 2.1

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

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

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

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

3

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

$4\sin\left(\frac{2\pi}{2.1}x\right)$

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.

Left / right

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

$bx - c$

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

d = vertical shift ⟶ positive ⇒ shift up $\quad$ negative ⇒ shift down

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

$|a|$ = amplitude

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

the left and right endpoints of a one-cycle interval can be found by solving the two equations $bx - c = 0$ and $bx - c = 2\pi$

Example

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

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

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

$a = \frac{1}{2}$

$b = 1$

$c = \frac{\pi}{3}$

$d = 0$

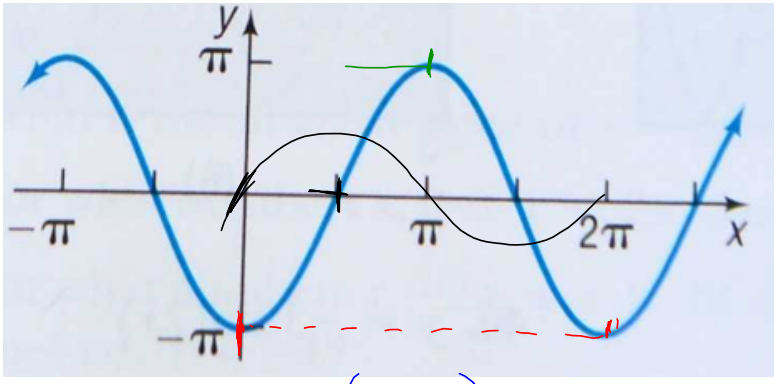
amp : $\frac{1}{2}$

$\frac{2\pi}{b}$ Per : 2π

$\frac{c}{b}$ P.S. : $\frac{\pi}{3}$ (right)

V.S : 0

Write the equation that would produce this graph.



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

$|a| = amp = \pi$

$b \rightarrow \frac{2\pi}{1} = period = 2\pi \rightarrow b = 1$

$c \rightarrow \frac{c}{b} = phaseshift \rightarrow \pi = c$

$d = 0$

Sine

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

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

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