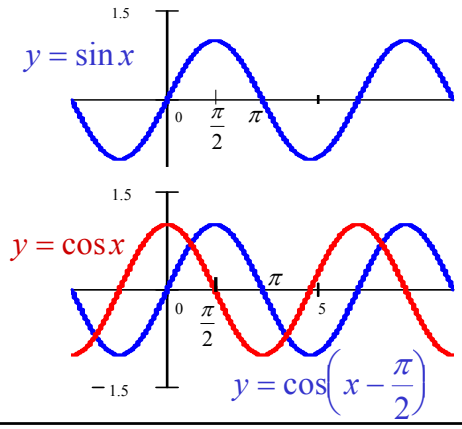


The graphs of the sine and cosine functions are called **sinusoidal graphs.**

Theorem

If $\omega > 0$, the amplitude and period of $y = A\sin\omega x$ and $y = A\cos\omega x$ are given by

$$\text{Amplitude} = |A| \qquad \text{Period} = T = \frac{2\pi}{\omega}$$

Determine the amplitude and period of $y = -2\sin 2x$, and graph the function.

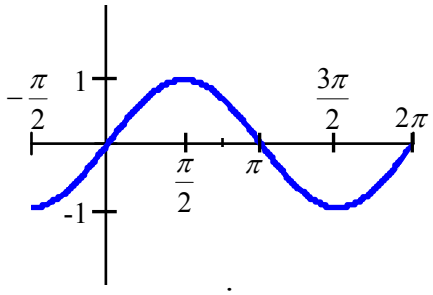
$$y = -2\sin 2x$$

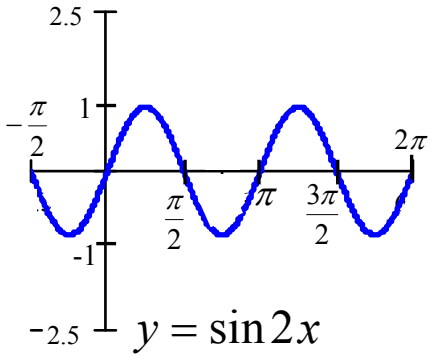
$$y = A\sin\omega x$$

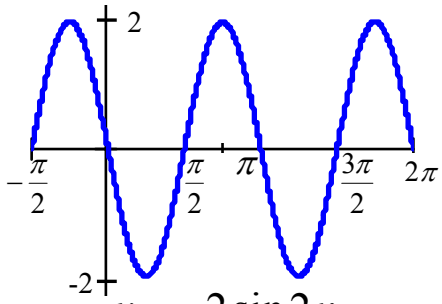
$$A = -2,\ \omega = 2$$

$$\text{Amplitude} = |-2| = 2$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{2} = \pi$$

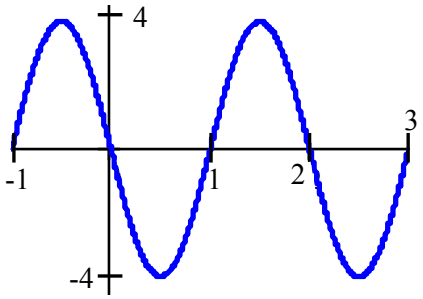






$y = -2\sin 2x$

Find an equation for the graph.



Period $= T = 2$ Amplitude $= 4$

Period $= T = 2$ Amplitude $= A = 4$

$$T = \frac{2\pi}{\omega}$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{2} = \pi$$

$$y = -A\sin\omega x$$

$$y = -4\sin\pi x$$

For the graphs of

$$y = A\sin(\omega x - \phi) = A\sin\left[\omega\left(x - \frac{\phi}{\omega}\right)\right]$$

or

$$y = A\cos(\omega x - \phi) = A\cos\left[\omega\left(x - \frac{\phi}{\omega}\right)\right]$$

with $\omega > 0$,

Amplitude $= |A|$ Period $= T = \frac{2\pi}{\omega}$

Phase shift $= \frac{\phi}{\omega}$

Find the amplitude, period, and phase shift of $y = -3\sin(\pi x + 2)$, and graph the function.

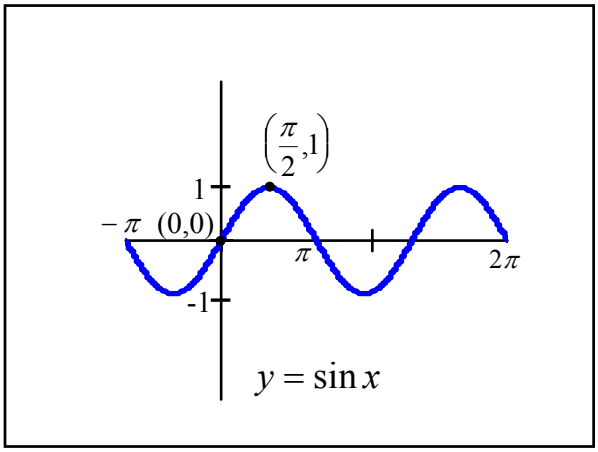
$y = A\sin(\omega x - \phi)$

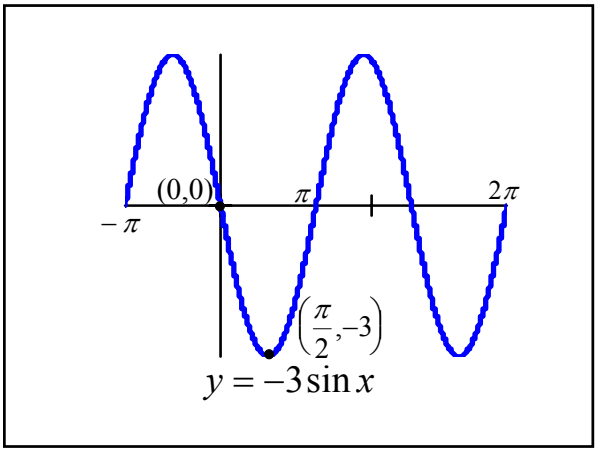
$y = -3\sin(\pi x + 2)$ $A = -3, \omega = \pi, \phi = -2$

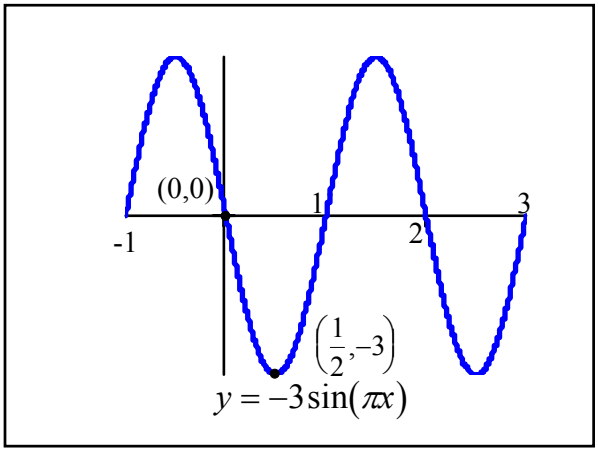
Amplitude $= |A| = |-3| = 3$

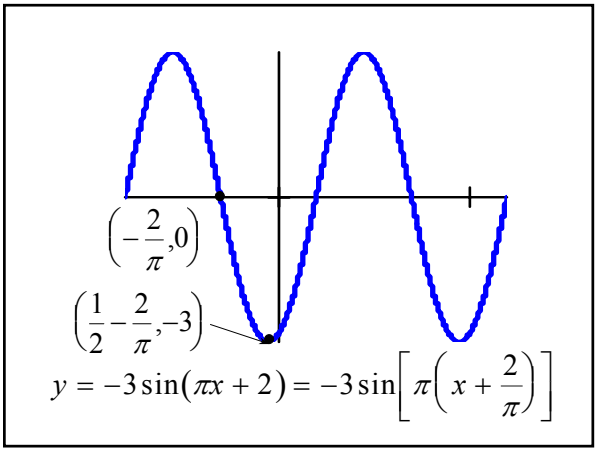
Period $= T = \frac{2\pi}{\omega} = \frac{2\pi}{\pi} = 2$

Phase shift $= \frac{\phi}{\omega} = \frac{-2}{\pi}$


$\left(\frac{\pi}{2},1\right)$
1
$-\pi$
(0,0)
π
2π
-1
$y = \sin x$


(0,0)
π
2π
$-\pi$
$\left(\frac{\pi}{2},-3\right)$
$y = -3\sin x$


(0,0)
1
3
-1
2
$\left(\frac{1}{2},-3\right)$
$y = -3\sin(\pi x)$


$\left(-\frac{2}{\pi},0\right)$
$\left(\frac{1}{2}-\frac{2}{\pi},-3\right)$
$y = -3\sin(\pi x + 2) = -3\sin\left[\pi\left(x + \frac{2}{\pi}\right)\right]$