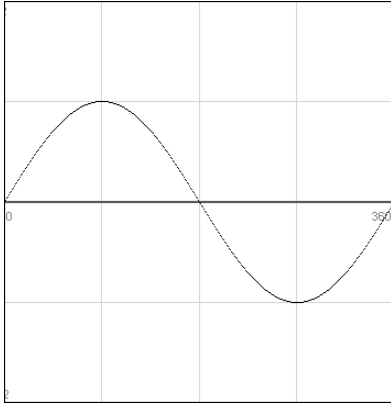
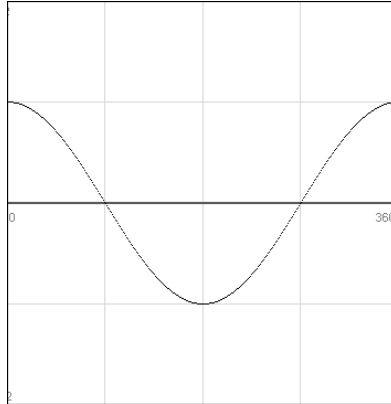


Graphs of Sine and Cosine Functions

$$y = \sin x$$



$$y = \cos x$$



$$y = a \sin bx$$

$$y = a \cos bx$$

$|a|$ = amplitude - half the distance between the maximum and minimum values

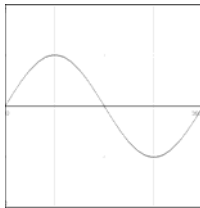
b = frequency - the number of cycles in 2π radians

$\frac{2\pi}{b}$ = period - how long it takes to complete one cycle

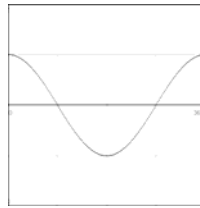
Transformations of the Sine and Cosines Functions

$$a > 0$$

$$y = \sin x$$



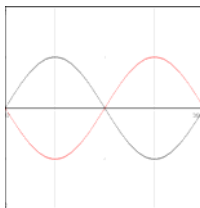
$$y = \cos x$$



$$a < 0$$

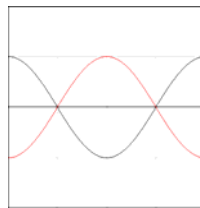
$$y = \sin x$$

$$y = -\sin x$$



$$y = \cos x$$

$$y = -\cos x$$



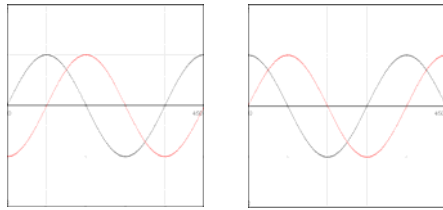
$$y = \sin x$$

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

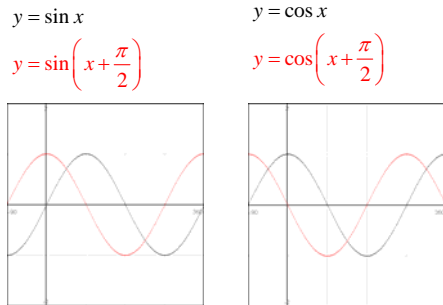
$$y = \cos x$$

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

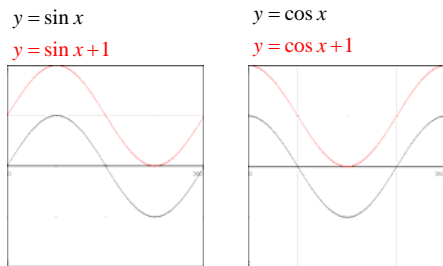
$y = \sin(x-h)$
 $y = \cos(x-h)$
 Shift graph h units to the right



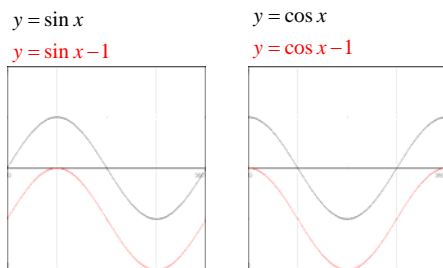
$y = \sin(x+h)$
 $y = \cos(x+h)$
 Shift graph h units to the left



$y = \sin x + k$
 $y = \cos x + k$
 Shift graph k units up

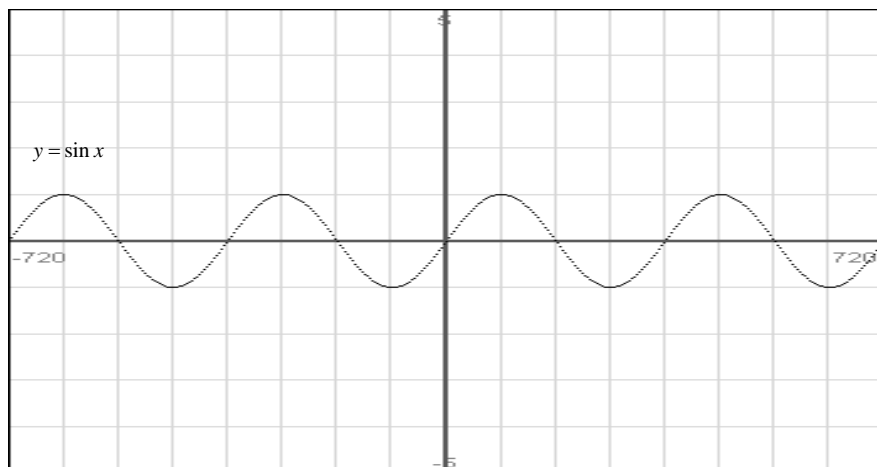


$y = \sin x - k$
 $y = \cos x - k$
 Shift graph k units down

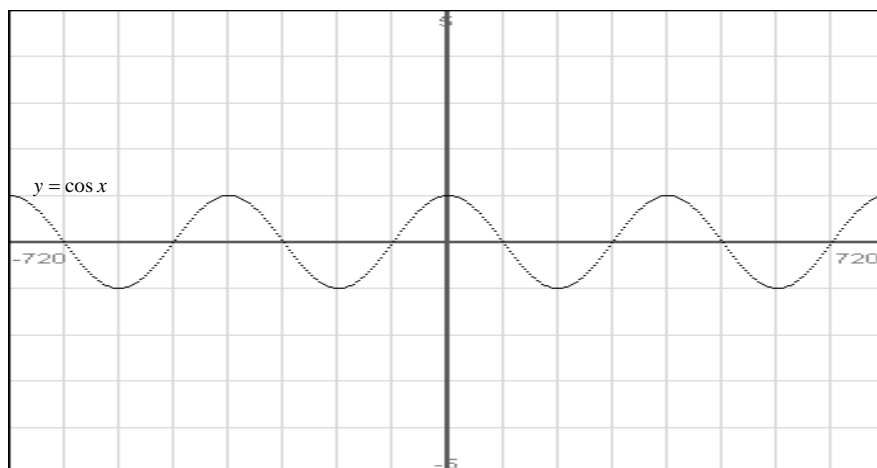


Directions: Sketch two full periods of the graph of each function.

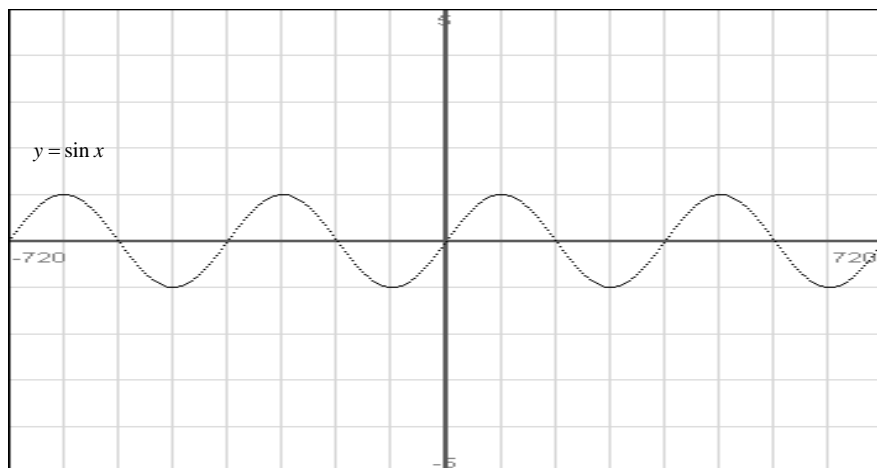
1. $y = 3\sin(2x)$



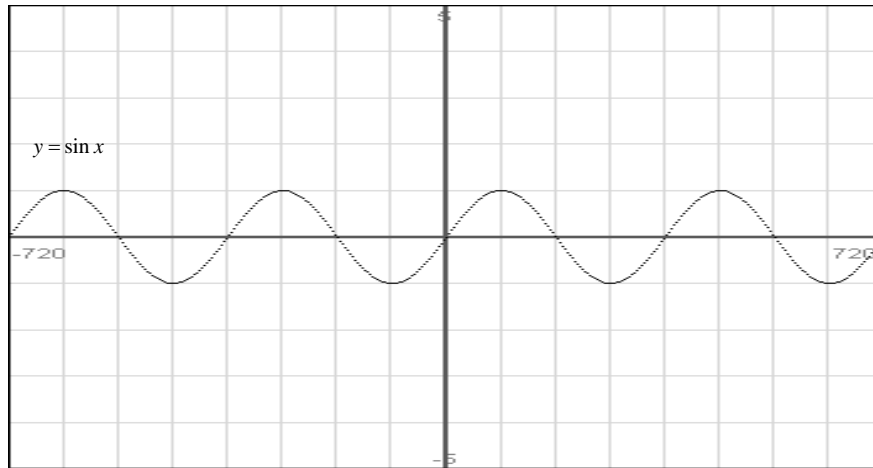
2. $y = -2\cos\left(\frac{\pi x}{2}\right)$



3. $y = \frac{1}{2}\sin\left(x + \frac{\pi}{4}\right)$



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



5. $y = 2 + \cos\left(x - \frac{\pi}{2}\right)$

