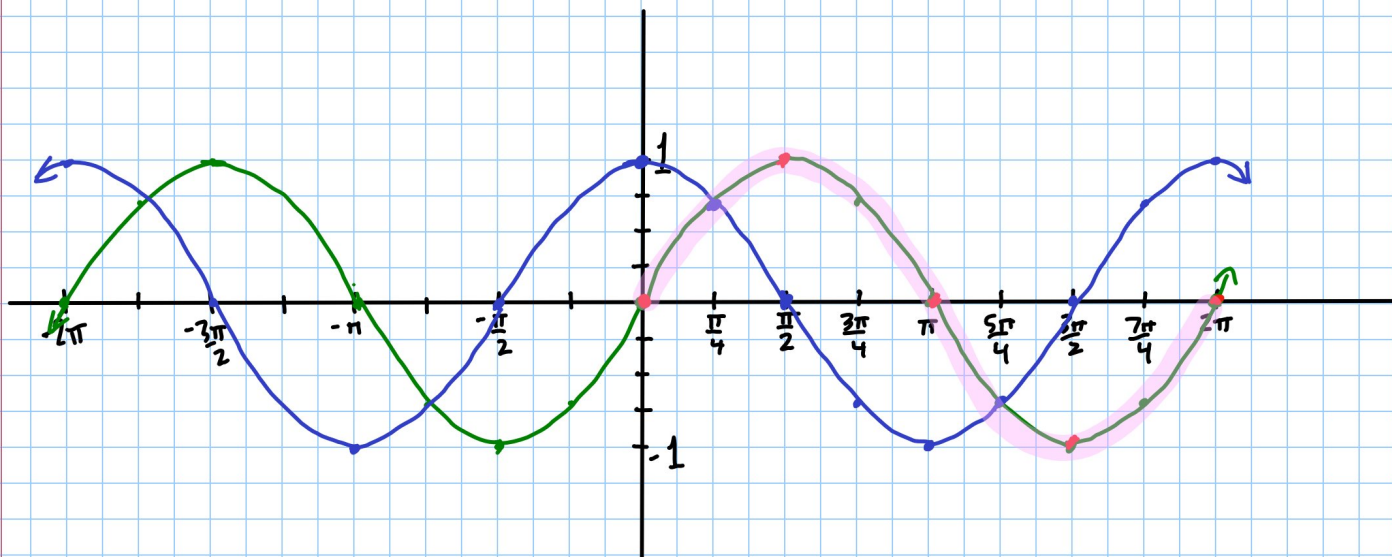


WARMUP - Put your calculator in radian mode and fill in the chart with decimals to the nearest 100th.

Angle, θ	$\sin \theta$	$\cos \theta$
0	0	1
$\frac{\pi}{4}$	0.71	0.71
$\frac{\pi}{2}$	1	0
$\frac{3\pi}{4}$	0.71	-0.71
π	0	-1
$\frac{5\pi}{4}$	-0.71	-0.71
$\frac{3\pi}{2}$	-1	0
$\frac{7\pi}{4}$	-0.71	0.71
2π	0	1



Section 5.4 Graphs of $y = \sin x$ and $y = \cos x$

Key Points of $y = \sin x$: $(0, 0)$, $(\frac{\pi}{2}, 1)$, $(\pi, 0)$, $(\frac{3\pi}{2}, -1)$, $(2\pi, 0)$

Key Points of $y = \cos x$: $(0, 1)$, $(\frac{\pi}{2}, 0)$, $(\pi, -1)$, $(\frac{3\pi}{2}, 0)$, $(2\pi, 1)$

Characteristics: for $\sin x$ and $\cos x$

$$D = (-\infty, \infty) \quad R = [-1, 1]$$

$$\text{Period} = 2\pi$$

Review:

$f(x-h) \Rightarrow$ Right h units

$f(x+h) \Rightarrow$ Left h units

$f(x)+k \Rightarrow$ Up k units

$f(x)-k \Rightarrow$ Down k units

$a f(x) \Rightarrow$ Multiply y by a

$$\frac{2\pi}{4} + \frac{\pi}{4} = \frac{3\pi}{4}$$

ex: $y = 3 \cos\left(x - \frac{\pi}{4}\right)$

↑
mult y by 3

Right $\frac{\pi}{4}$

$(0, 1) \longrightarrow \left(\frac{\pi}{4}, 3\right)$

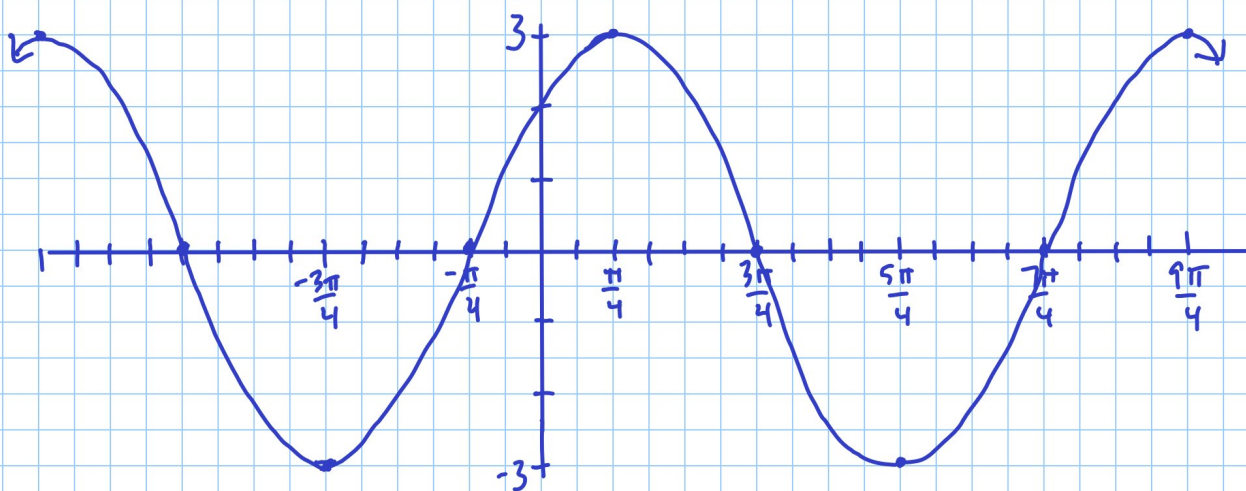
$x + \frac{\pi}{4}$ ↓
 $y \times 3$ ↓

$\left(\frac{\pi}{2}, 0\right) \longrightarrow \left(\frac{3\pi}{4}, 0\right)$

$(\pi, -1) \longrightarrow \left(\frac{5\pi}{4}, -3\right)$

$\left(\frac{3\pi}{2}, 0\right) \longrightarrow \left(\frac{7\pi}{4}, 0\right)$

$(2\pi, 1) \longrightarrow \left(\frac{9\pi}{4}, 3\right)$



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

↑
mult y by -2

Right $\frac{\pi}{2}$

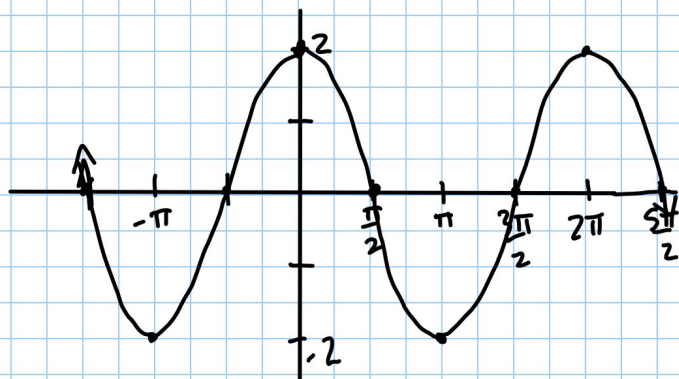
$(0, 0) \longrightarrow \left(\frac{\pi}{2}, 0\right)$

$\left(\frac{\pi}{2}, 1\right) \longrightarrow (\pi, -2)$

$(\pi, 0) \longrightarrow \left(\frac{3\pi}{2}, 0\right)$

$$\left(\frac{3\pi}{2}, -1\right) \rightarrow (2\pi, 2)$$

$$(2\pi, 0) \rightarrow \left(\frac{5\pi}{2}, 0\right)$$



Graph 2 Periods, Showing Transformation of Key Points

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

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

$$3) y = \cos\left(x + \frac{\pi}{6}\right)$$

$$4) y = \underset{\substack{\uparrow \\ \text{mult } y \text{ by } 3}}{3} \sin\left(x + \frac{\pi}{3}\right) + \underset{\substack{\uparrow \\ \text{add } 1 \text{ to } y}}{1}$$

$$(0, 0) \rightarrow (, 1)$$

$$\left(\frac{\pi}{2}, 1\right) \rightarrow (, 4)$$

$$(\pi, 0) \rightarrow (, 1)$$

$$\left(\frac{3\pi}{2}, -1\right) \rightarrow (, -2)$$

$$(2\pi, 0) \rightarrow (, 1)$$