Find a sine and a cosine equation for each graph.

①

②

3π/4 left
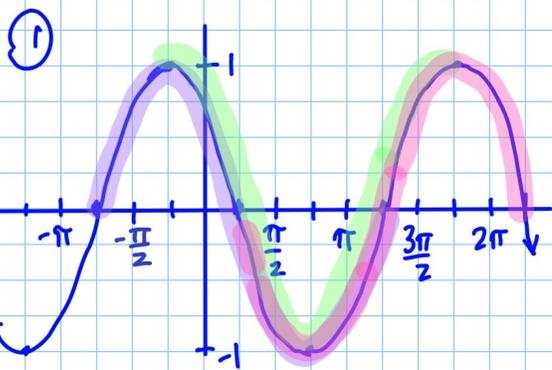
$$y = \sin\left(x + \frac{3\pi}{4}\right)$$
$$y = -\sin\left(x - \frac{\pi}{4}\right)$$
$$y = \cos\left(x + \frac{\pi}{4}\right)$$
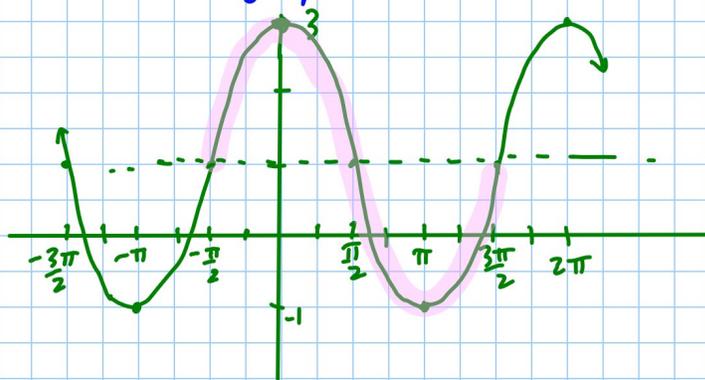
$$y = 2\cos x + 1$$

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

5.4 continued

right $\frac{\pi}{2}$

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

↑ multiply y by -2   ↑ up 2

$+\frac{\pi}{2}$ mult by -2 add 2

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

$\left(\frac{\pi}{2}, 1\right) \longrightarrow (\pi, 0)$

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

$\left(\frac{3\pi}{2}, -1\right) \longrightarrow (2\pi, 4)$
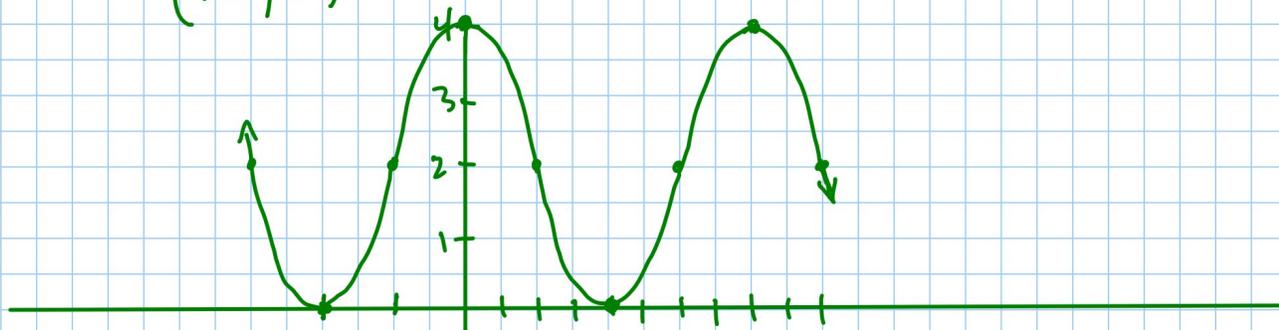
$(2\pi, 0) \longrightarrow \left(\frac{5\pi}{2}, 2\right)$

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

use this scaling

Keys

sine	Cosine
$(0,0)$	$(0,1)$
$\left(\frac{\pi}{2},1\right)$	$\left(\frac{\pi}{2},0\right)$
$(\pi,0)$	$(\pi,-1)$
$\left(\frac{3\pi}{2},-1\right)$	$\left(\frac{3\pi}{2},0\right)$
$(2\pi,0)$	$(2\pi,1)$

Number line marked: $\frac{\pi}{6}$ $\frac{\pi}{2}$ π $\frac{3\pi}{2}$

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

$(0,1) \rightarrow \left(-\frac{\pi}{6}, \quad -\frac{\pi}{6}\right)$

$\left(\frac{\pi}{2}, 0\right) \rightarrow \left(\frac{\pi}{3}, \quad\right)$
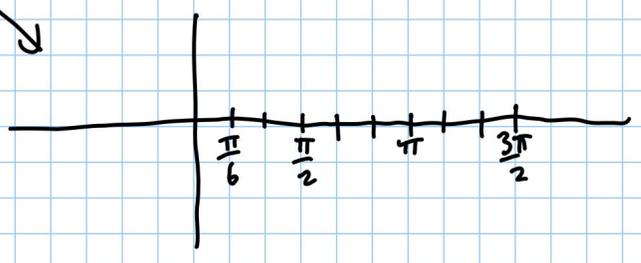
$(\pi, -1)$

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

$(2\pi, 0)$

$\frac{\pi}{2} - \frac{\pi}{6} = \pi\left(\frac{1}{2} - \frac{1}{6}\right)$

$\underbrace{\quad}_{\text{CALCULATOR}}$

$1/2 - 1/6$ enter

▷ FRAC

$= \pi \cdot \frac{1}{3} = \frac{\pi}{3}$