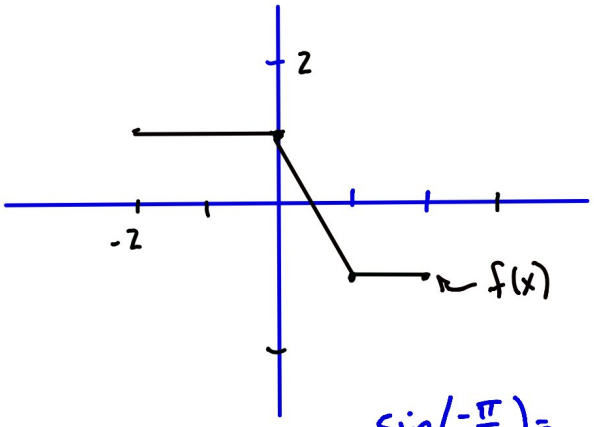
WARMUP

Given the graph of $f(x)$, graph a) $y = 2f(x)$

b) $y = f(x+2)$

c) $y = f(x)+1$

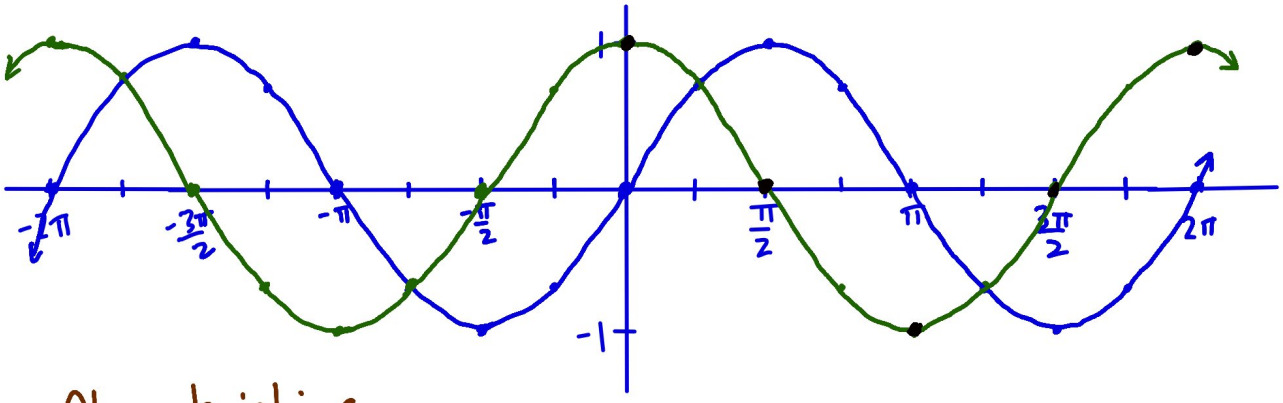
d) $y = f(x-1)+3$



$\sin\left(-\frac{\pi}{4}\right) =$ $\frac{\sqrt{2}}{2} \approx .71$

Section 5.4

x	-2π	$-\frac{7\pi}{4}$	$-\frac{3\pi}{2}$	$-\frac{5\pi}{4}$	$-\pi$	$-\frac{3\pi}{4}$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$\sin x$	0	.71	1	.71	0	-.71	-1	-.71	0	.71	1	.71	0	-.71	-1	-.71	0
$\cos x$	1	.71	0	-.71	-1	-.71	0	.71	1	.71	0	-.71	-1	-.71	0	.71	1



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

$D = (-\infty, \infty)$

$R = [-1, 1]$

Period $= 2\pi$

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

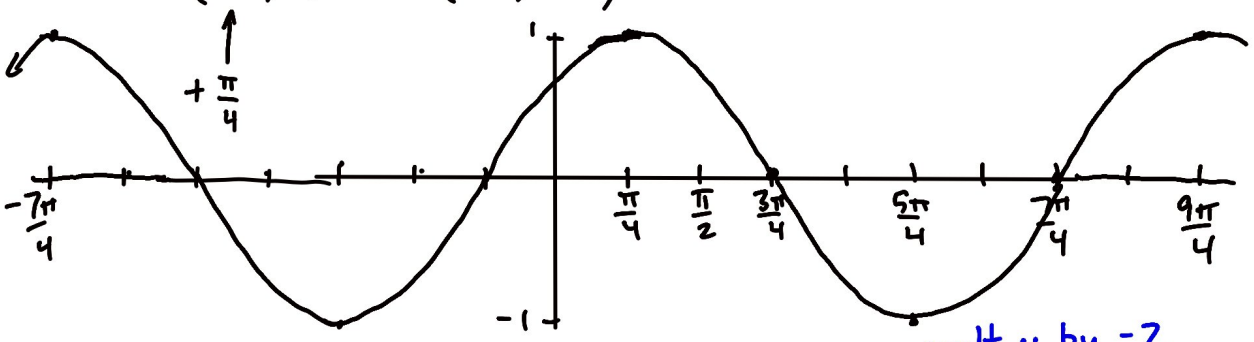
$(0,1) \rightarrow \left(\frac{\pi}{4}, 1\right)$

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

$\frac{4\pi}{4}+\frac{\pi}{4}$ $(\pi, -1) \rightarrow \left(\frac{5\pi}{4}, -1\right)$

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

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



Key Points

For cosine:
$(0,1)$
$\left(\frac{\pi}{2}, 0\right)$
$(\pi, -1)$
$\left(\frac{3\pi}{2}, 0\right)$
$(2\pi, 1)$

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

ex: $y = -2\sin\left(x - \frac{\pi}{2}\right)$ ← $+\frac{\pi}{2}$ to x; ↓ mult y by -2

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