

Graphing Trig Functions – Horizontal Shifts

Objective: Be able to find the key information and graph trig functions with a horizontal shift – and graph a horizontal shift with another transformation.

Recall:

$$y = |x|$$

parent
function

$$y = -|x|$$

reflection

$$y = |x - 3| + 4$$

right 3,
up 4

Same ideas apply to trig functions!

1. $y = \sin(x - \pi)$

Vertical shift: none

Sinusoidal axis: $y = 0$ Reflected? no

Amplitude: 1

Domain: $(-\infty, \infty)$ Range: $[-1, 1]$

$\frac{2\pi}{1}$

Period: 2π

Horizontal shift: right π

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

Vertical shift: none

Sinusoidal axis: $y = 0$ Reflected? no

Amplitude: 1

Domain: $(-\infty, \infty)$ Range: $[-1, 1]$

$\frac{2\pi}{1}$

Period: 2π

Horizontal shift: left $\frac{\pi}{4}$

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

Vertical shift: none

Sinusoidal axis: $y = 0$ Reflected? yes

Amplitude: 3

Domain: $(-\infty, \infty)$ Range: $[-3, 3]$

Period: 2π

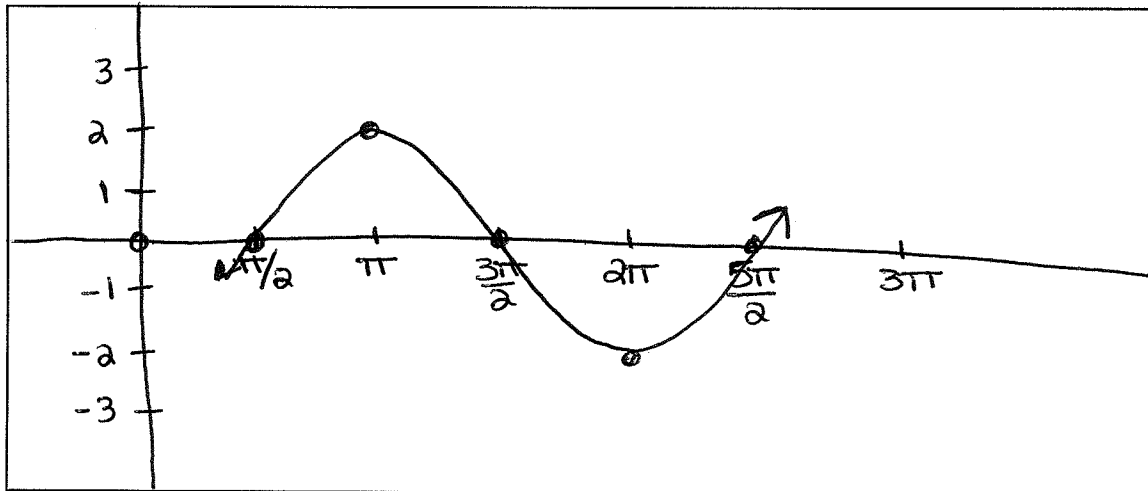
Horizontal shift: right $\frac{\pi}{2}$

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

Vertical shift: none Sinusoidal axis: $y=0$ Reflected? no

Amplitude: 2 Domain: $(-\infty, \infty)$ Range: $[-2, 2]$

Period: 2π Horizontal shift: right $\frac{\pi}{2}$



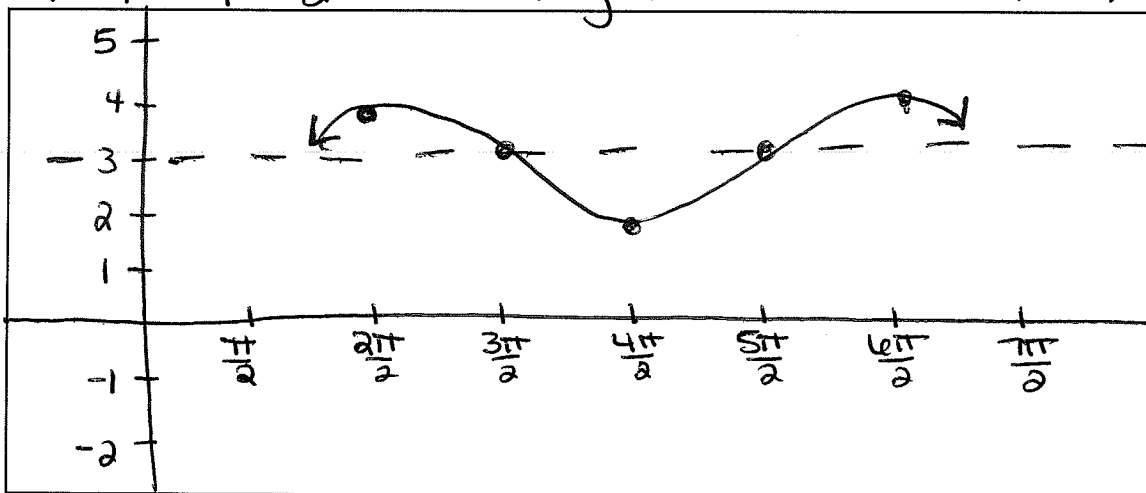
5. $y = 3 + \cos(x - \pi)$

Vertical shift: up 3 Sinusoidal axis: $y=3$ Reflected? no

Amplitude: 1 Domain: $(-\infty, \infty)$ Range: $[2, 4]$

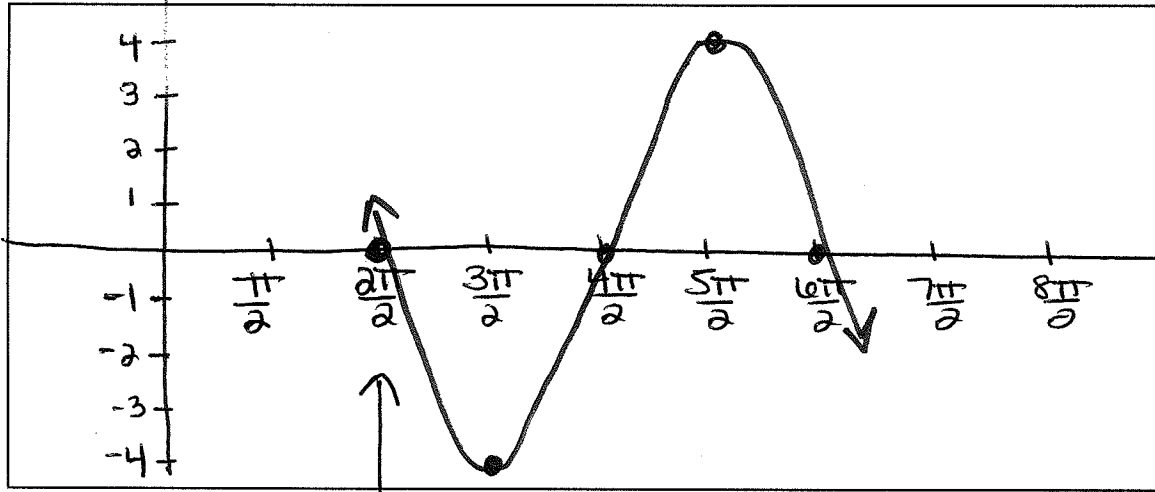
Period: 2π Horizontal shift: right π

$\frac{2\pi}{1} \cdot \frac{1}{4} = \frac{2\pi}{4} = \frac{\pi}{2} \rightarrow$ key values: $0, \frac{\pi}{2}, \frac{2\pi}{2}, \frac{3\pi}{2}, \frac{4\pi}{2}, \frac{5\pi}{2}, \frac{6\pi}{2}$



6. $y = -4\sin(x - \pi)$

Vertical shift: none Sinusoidal axis: $y = 0$ Reflected? yes
 Amplitude: 4 Domain: $(-\infty, \infty)$ Range: $[-4, 4]$
 Period: 2π Horizontal shift: right π



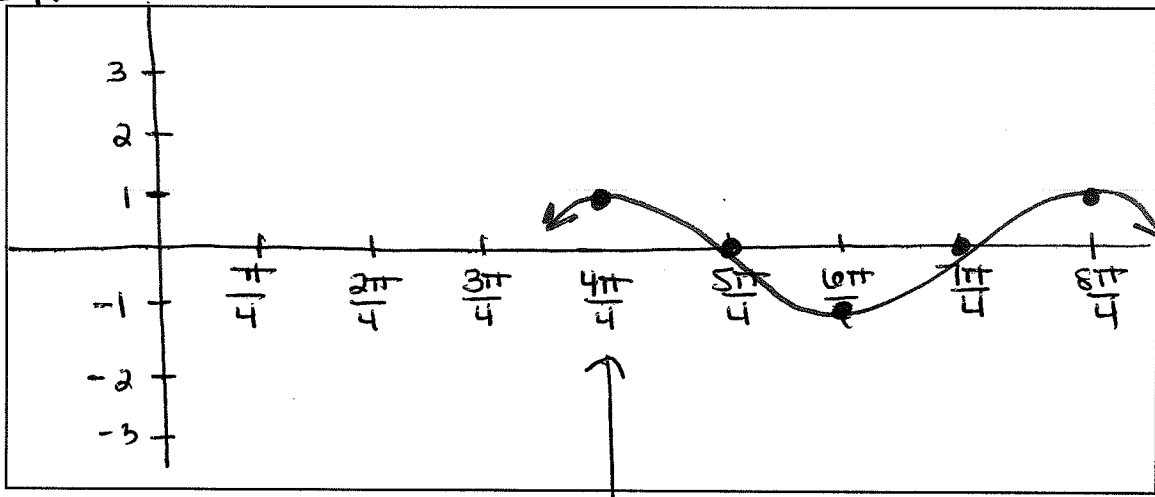
$2\pi \cdot \frac{1}{4} = \frac{2\pi}{4}$
 $= \frac{\pi}{2}$

7. $y = \cos 2(x - \pi)$

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

Vertical shift: none Sinusoidal axis: $y = 0$ Reflected? no
 Amplitude: 1 Domain: $(-\infty, \infty)$ Range: $[-1, 1]$
 Period: π Horizontal shift: right π

$\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$



$\pi \cdot \frac{1}{4} = \frac{\pi}{4}$

$\frac{4\pi}{4} = \pi$