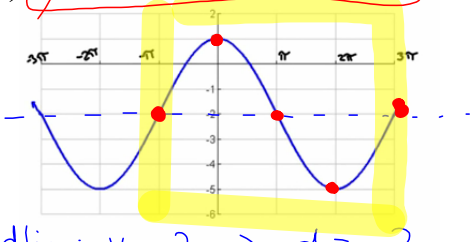
$y = a\sin(bx - c) + d$ $y = a\cos(bx - c) + d$

Write the equation of the sin/cos functions given the graph.

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



midline: $y = -2 \rightarrow d = -2$

amplitude: $3 \rightarrow a = 3$

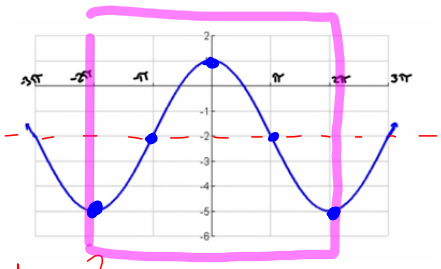
period $= 4\pi \rightarrow b = 1/2$

$\frac{2\pi}{b} = 4\pi$ $b = \frac{2\pi}{4\pi}$

phase shift: $-\pi$ (left π)

$\frac{c}{b} = \boxed{\frac{c}{1/2} = -\pi}$ $c = \frac{-\pi}{2}$

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



$\rightarrow d = -2$

$\rightarrow$ amp $= 3$, $a = -3$

reflection in x-axis

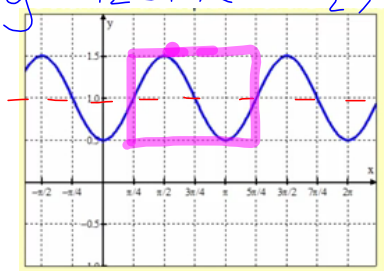
$\rightarrow$ period: 4π, $b = 1/2$

phase shift: -2π (left 2π)

$\frac{c}{b} = \frac{c}{1/2} = -2\pi$ $c = -\pi$

Write the equation of the sin/cos functions given the graph.

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



midline $y = 1 \rightarrow d = 1$

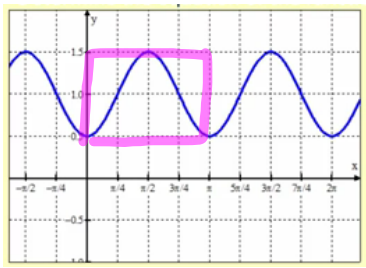
amplitude: $1/2$, $a = 1/2$

period: $\pi \rightarrow b = 2$

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

phase shift: $\frac{\pi}{4}$ (right $\frac{\pi}{4}$)

$\frac{c}{b} = \boxed{\frac{c}{2} = \frac{\pi}{4 \cdot 2}}$ $c = \frac{\pi}{2}$



ex. $y = -\frac{1}{2}\cos 2x + 1$

OR $y = \frac{1}{2}\cos(2x - \pi) + 1$

OR $y = \frac{1}{2}\cos(2x + \pi) + 1$

4.) Create a cosine function with the given information:

Amplitude: 2 $\rightarrow a = 2$

Period: 4π $\rightarrow b = 1/2$

period $\frac{2\pi}{b} = 4\pi$ $\frac{2\pi}{4\pi} = b$

Phase Shift: $-\frac{\pi}{3}$

phase shift $\frac{c}{b} = \frac{c}{1/2} = -\frac{\pi}{3} \cdot \frac{1}{2}$

Vertical translation: Down 2 $\rightarrow d = -2$

$c = -\frac{\pi}{6}$

$y = 2\cos\left(\frac{1}{2}x + \frac{\pi}{6}\right) - 2$