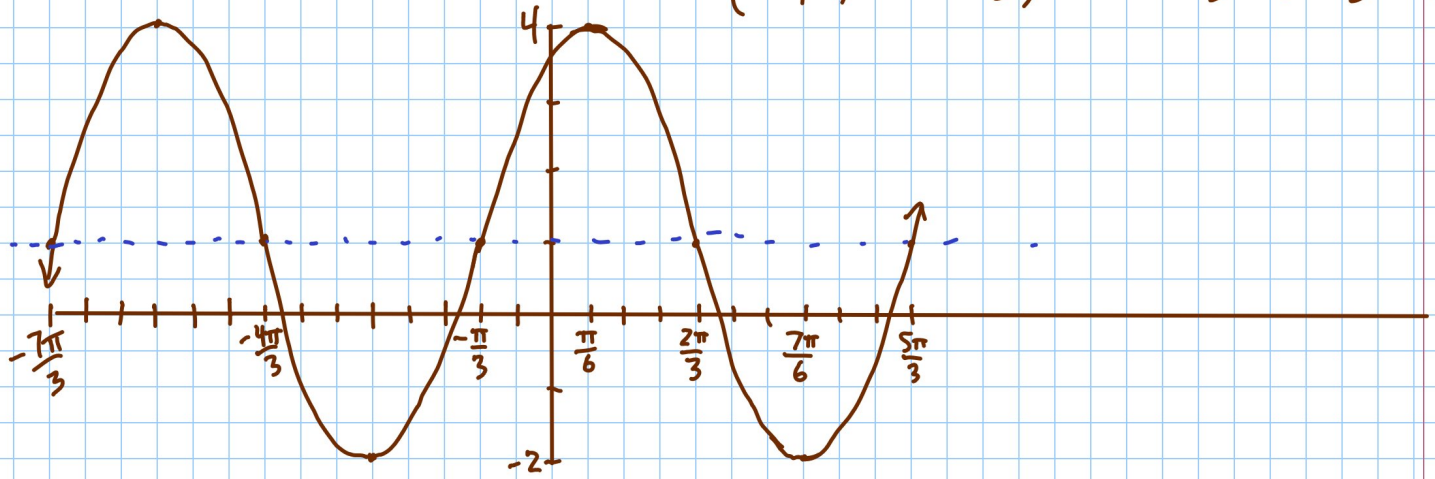
4) $y = 3\sin\left(x + \frac{\pi}{3}\right) + 1$

mult y by 3, add 1 to y

left $\frac{\pi}{3}$

| | | x's |
|---|---|---|
| $(0,0) \to (-\frac{\pi}{3}, 1)$ | | $0 - \frac{\pi}{3} = -\frac{\pi}{3}$ |
| $(\frac{\pi}{2}, 1) \to (\frac{\pi}{6}, 4)$ | | $\frac{\pi}{2} - \frac{\pi}{3} = \frac{3\pi}{6} - \frac{2\pi}{6} = \frac{\pi}{6}$ |
| $(\pi, 0) \to (\frac{2\pi}{3}, 1)$ | | $\pi - \frac{\pi}{3} = \frac{3\pi}{3} - \frac{\pi}{3} = \frac{2\pi}{3}$ |
| $(\frac{3\pi}{2}, -1) \to (\frac{7\pi}{6}, -2)$ | | $\frac{3\pi}{2} - \frac{\pi}{3} = \frac{9\pi}{6} - \frac{2\pi}{6} = \frac{7\pi}{6}$ |
| $(2\pi, 0) \to (\frac{5\pi}{3}, 1)$ | | $2\pi - \frac{\pi}{3} = \frac{6\pi}{3} - \frac{\pi}{3} = \frac{5\pi}{3}$ |




## Section 5.6 Sinusoidal Curves

Graph using period, phase shift (horizontal shift), and amplitude.

$y = a\sin(\omega x - \phi)$

$\omega$: greek letter "omega"

$\phi$: greek letter "phi"

$y = a\cos(\omega x - \phi)$

Amplitude $= |a|$

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

Phase Shift $= \frac{\phi}{\omega}$

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

$y = 3\sin\left(\frac{\pi}{4}x - 0\right)$

$a = 3$

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

$\phi = 0$

$\text{Amp} = |3| = 3$

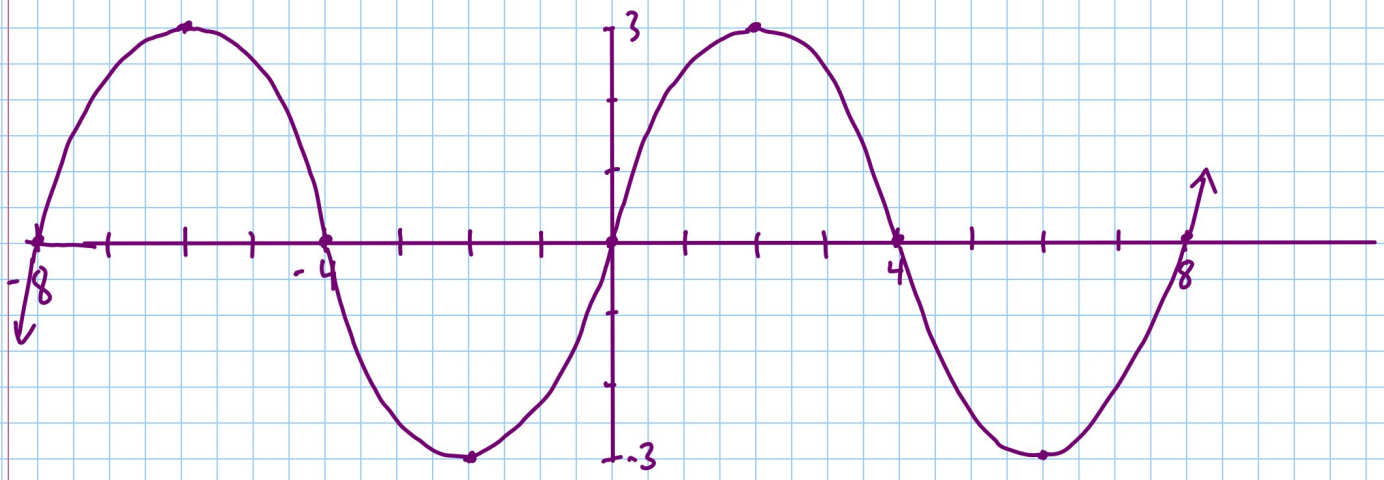
$\text{Period} = \frac{2\pi}{\frac{\pi}{4}} = 2\cancel{\pi}\cdot\frac{4}{\cancel{\pi}} = 8$

$\text{P.S.} = \frac{0}{\frac{\pi}{4}} = 0$

For sine → 0, a, 0, −a, 0

$(0,0)(2,3)(4,0)(6,-3)(8,0)$

P.S. | midpoint of 1st and 3rd x-values | midpoint of 1st and 5th x-values | midpoint of 3rd and 5th x-values | P.S. + Period




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

$a = -2$

$\omega = 4$

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

$\text{Amp} = |-2| = 2$

$\text{Period} = \frac{2\pi}{4} = \frac{\pi}{2}$

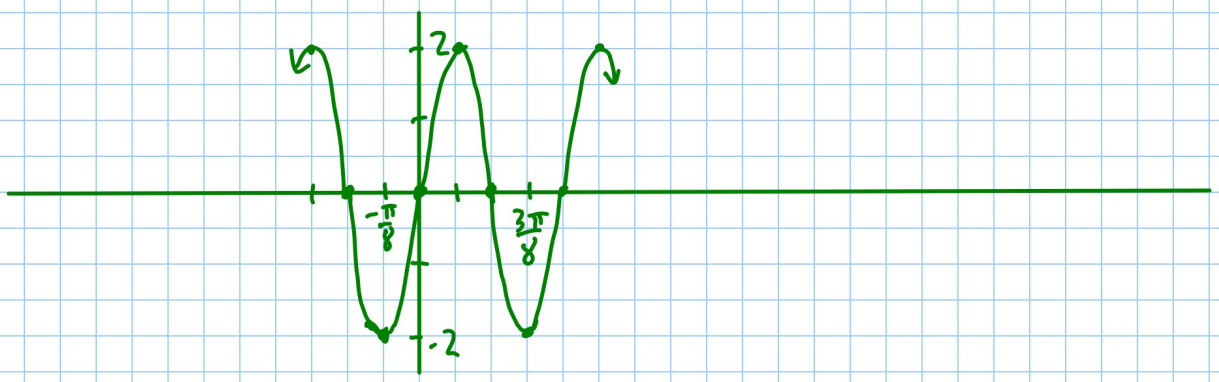
$\text{P.S.} = \frac{-\frac{\pi}{2}}{4} = -\frac{\pi}{2}\cdot\frac{1}{4} = -\frac{\pi}{8}$

For cosine: a, 0, −a, 0, a

$\left(-\frac{\pi}{8},-2\right), \left(0,0\right), \left(\frac{\pi}{8},2\right), \left(\frac{\pi}{4},0\right), \left(\frac{3\pi}{8},-2\right)$

P.S. | $\frac{1}{2}\left(-\frac{\pi}{8}+\frac{\pi}{8}\right)$ | $\frac{1}{2}\left(-\frac{\pi}{8}+\frac{3\pi}{8}\right) = \frac{1}{2}\left(\frac{2\pi}{8}\right)$ | $\frac{1}{2}\left(\frac{\pi}{8}+\frac{3\pi}{8}\right)$ | P.S. + period $-\frac{\pi}{8}+\frac{\pi}{2} = -\frac{\pi}{8}+\frac{4\pi}{8}$

$\frac{1}{2}\left(\frac{4\pi}{8}\right) = \frac{4\pi}{16}$ $= \frac{3\pi}{8}$




Graph the following, showing the work

1) $y = 4\sin(2x - \pi)$

2) $y = 2\cos(4x + 3\pi)$

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

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

1) $y = 4\sin(2x - \pi)$ $\left(\frac{\pi}{2}, 0\right)\left(\frac{3\pi}{4}, 4\right)(\pi, 0)\left(\frac{5\pi}{4}, -4\right)\left(\frac{3\pi}{2}, 0\right)$

Amp = 4

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

P.S. = $\frac{\pi}{2}$