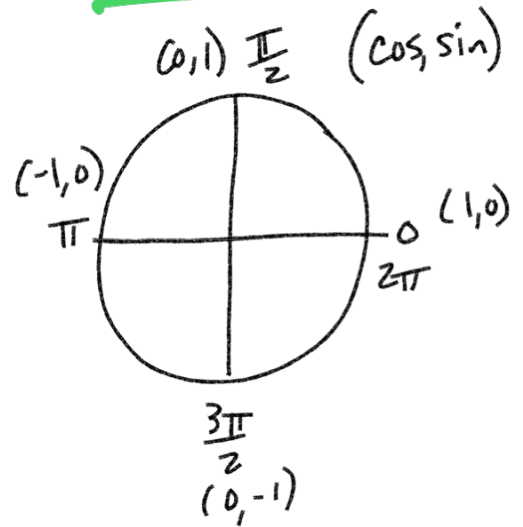
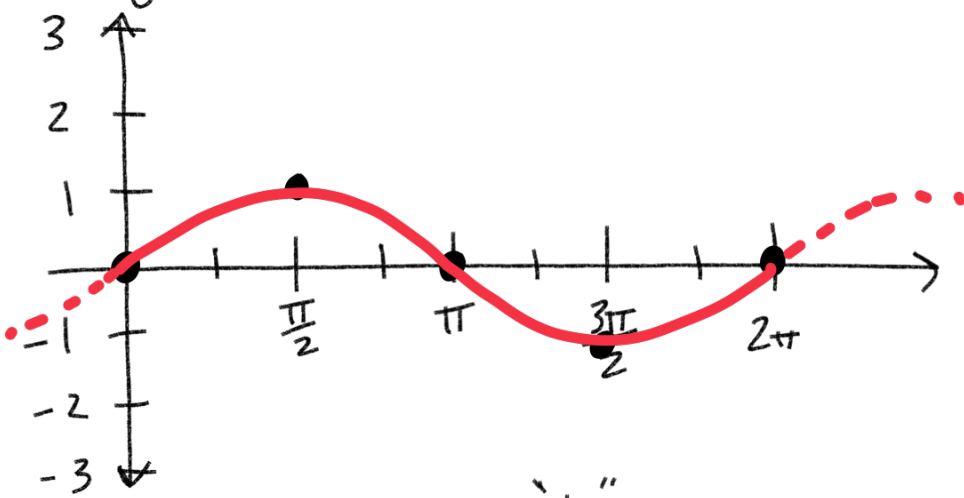


$$y = 2 \sin \left(2x - \frac{3\pi}{2} \right) + 1$$

↑ amplitude
 ↓ period
 ↓ horizontal shift
 ↓ vertical shift

- 1.) sin/cos wave ✓
- 2.) period ✓
- 3.) horizontal shift
- 4.) amplitude
- 5.) vertical shift

1.) $y = \sin X$

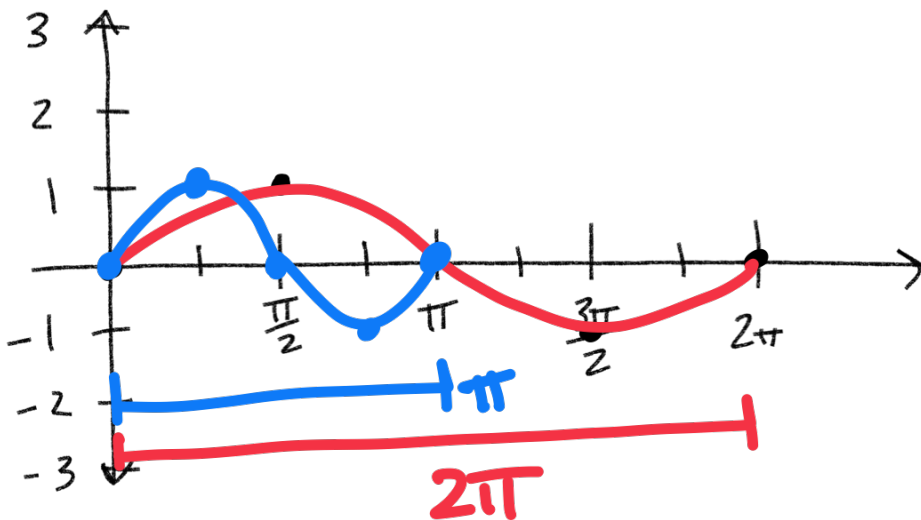


2.) $y = \sin(2x)$

↖ "b"

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

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



3.) Horizontal Shift

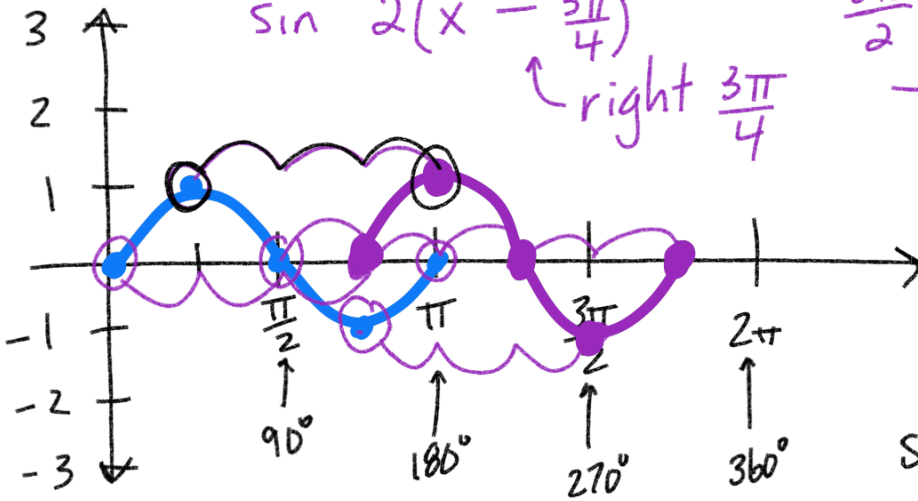
$$y = \sin\left(2x - \frac{3\pi}{2}\right)$$

$$\sin 2\left(x - \frac{3\pi}{4}\right)$$

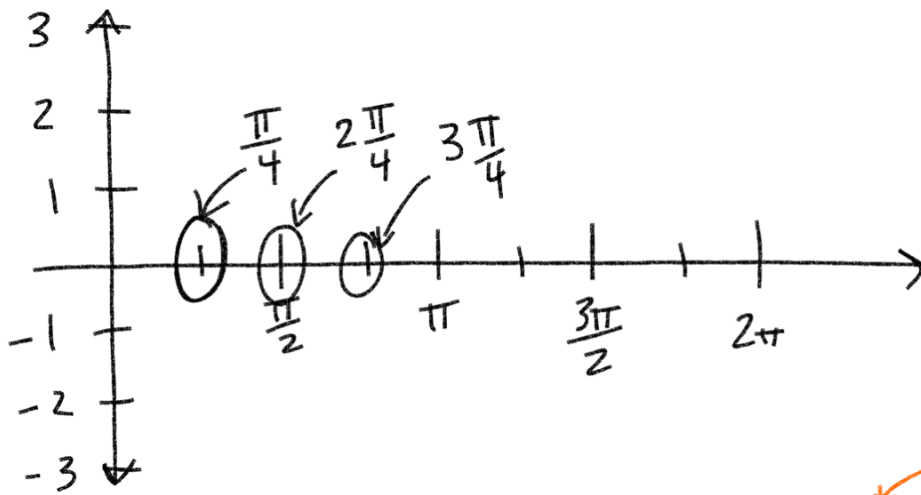
$$\frac{3\pi}{2} \div 2$$

$$\frac{3\pi}{2} * \frac{1}{2} = \frac{3\pi}{4}$$

$$\left[\frac{3\pi}{4} * \frac{45}{\pi} = 135^\circ \right]$$

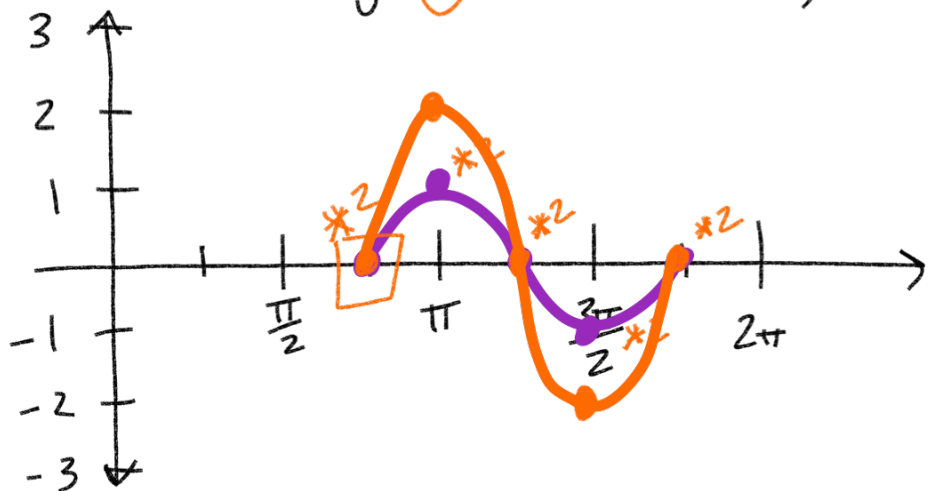


$$\text{shift } \frac{3\pi}{4} \quad 3\left(\frac{\pi}{4}\right)$$



4.) Amplitude

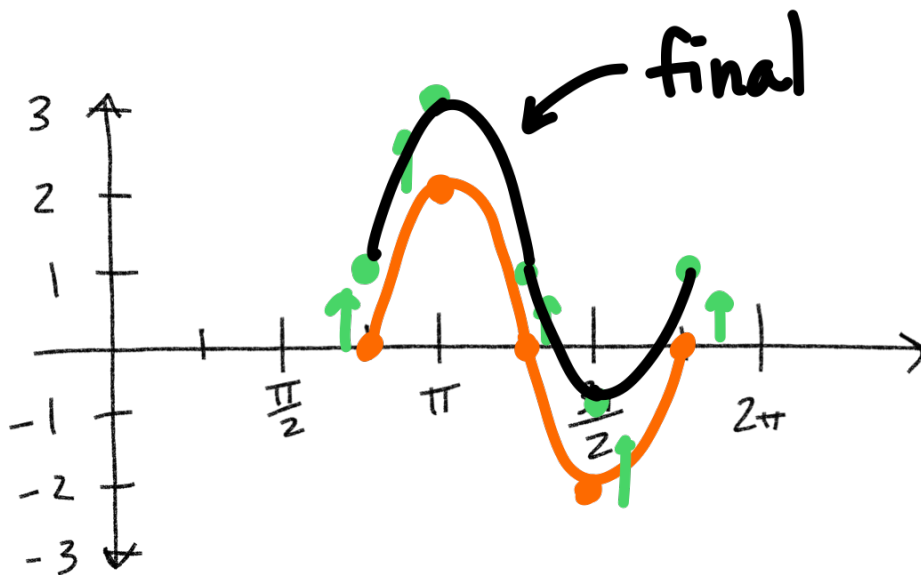
$$y = 2 \sin\left(2x - \frac{3\pi}{2}\right)$$



5.) Vertical Shift

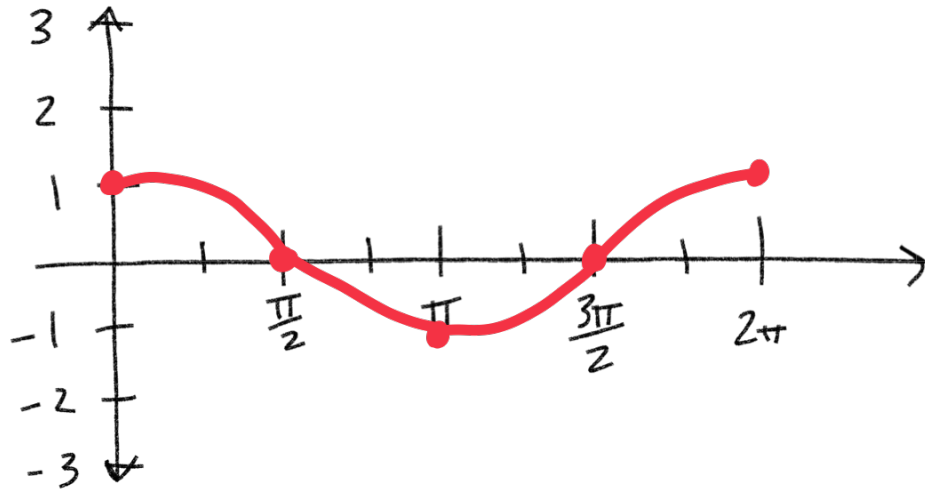
$$y = 2 \sin\left(2x - \frac{3\pi}{2}\right) + 1$$

shift up 1



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

1.) $\cos(x)$



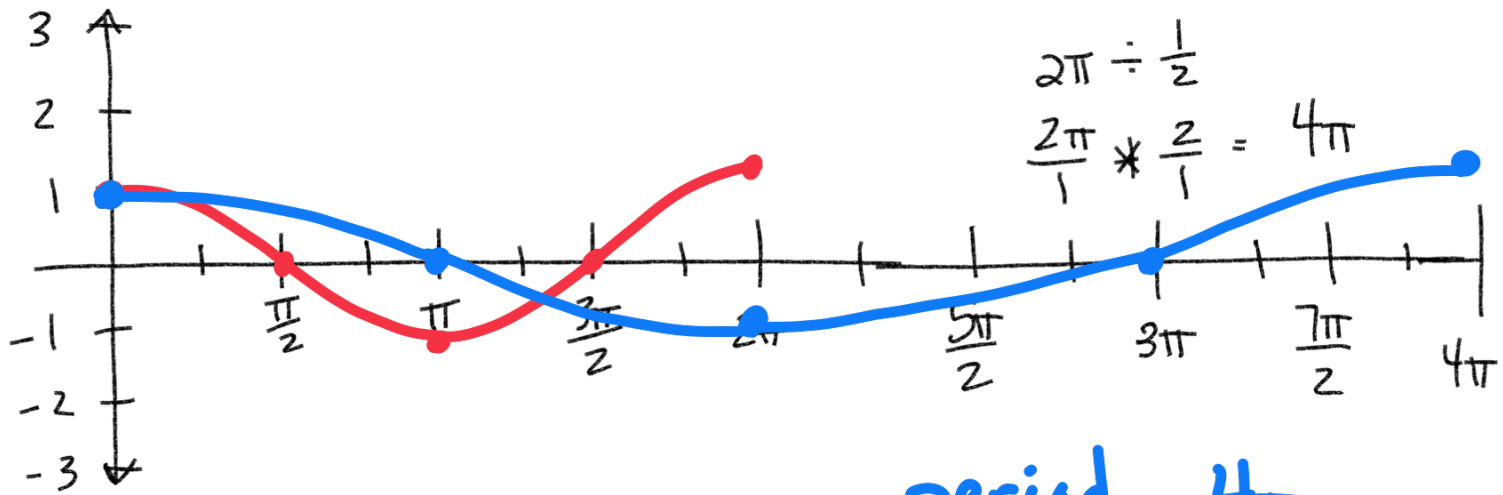
- 1.) sin/cos
- 2.) period
- 3.) horizontal shift
- 4.) amplitude
- 5.) vertical shift

2.) Period $y = \cos\left(\frac{x}{2}\right)$ or $\cos\left(\frac{1}{2}x\right)$

$$b = \frac{1}{2} \text{ period} = \frac{2\pi}{b}$$

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

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



$$\frac{\text{period}}{4} \quad \frac{4\pi}{4} = \pi$$

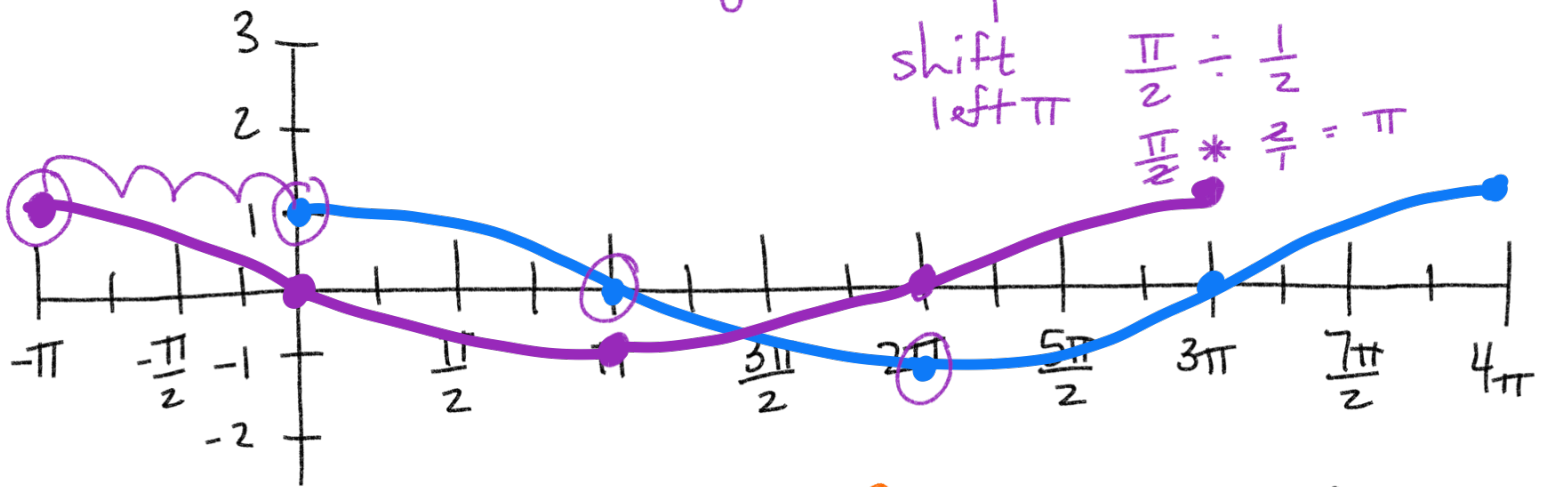
3.) Horizontal Shift

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

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

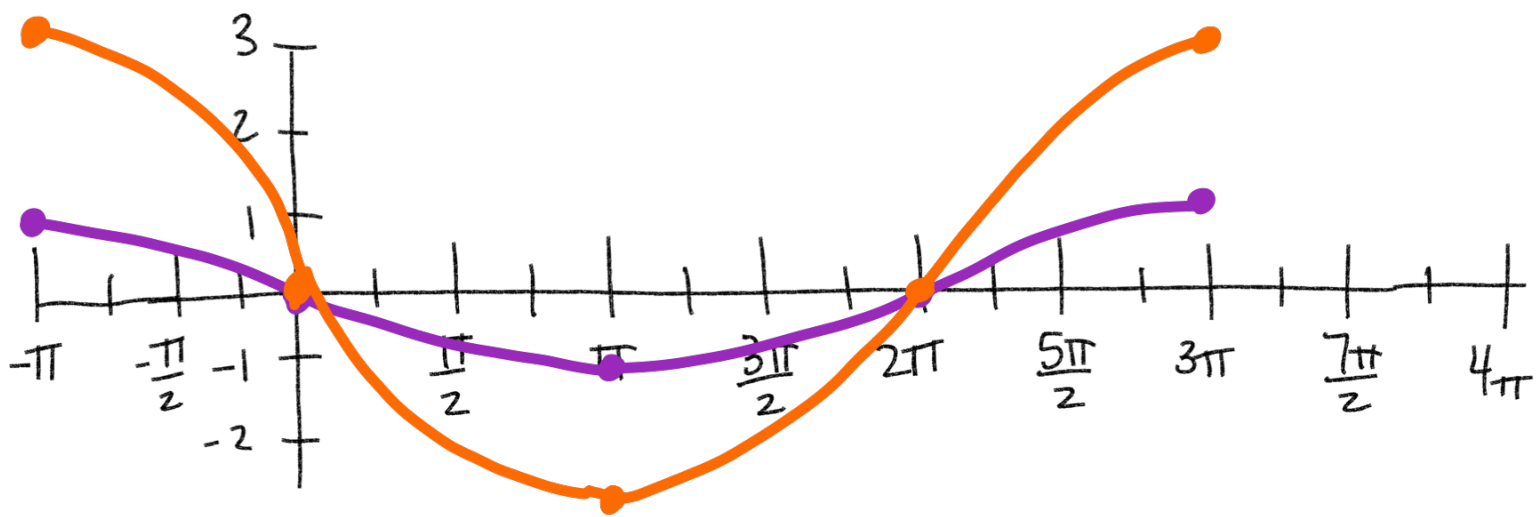
shift
left π

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



4.) Amplitude

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



5.) Vertical Shift

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

shift 4 down

