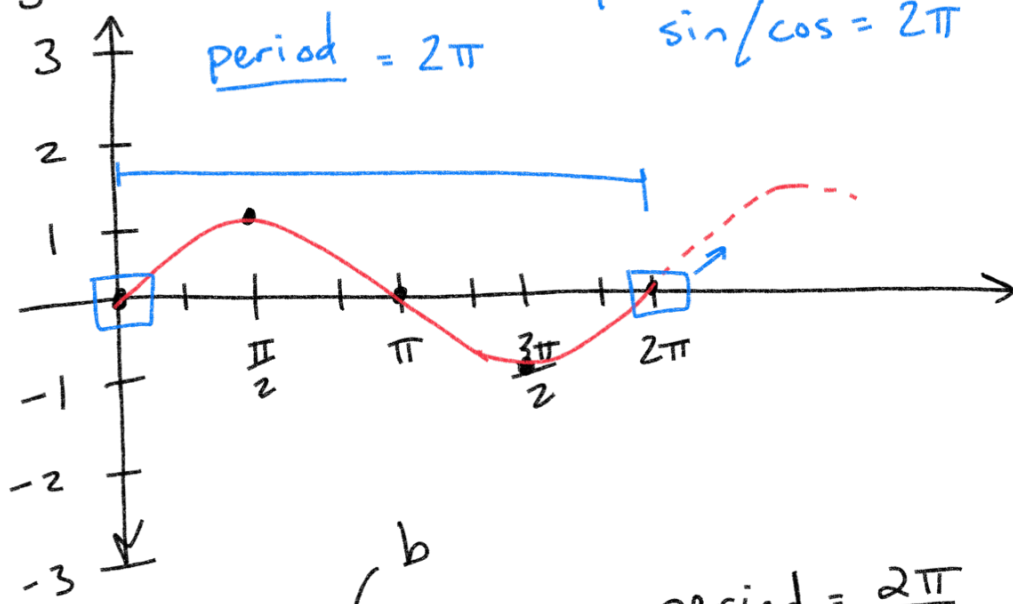


$$y = 2 \sin \left( 2x - \frac{3\pi}{2} \right) + 1$$

↑ amplitude      ↑ period      ↑ horizontal shift      vertical shift

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

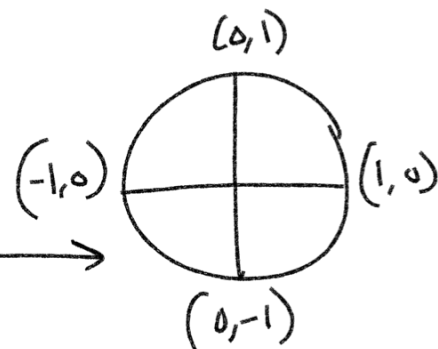
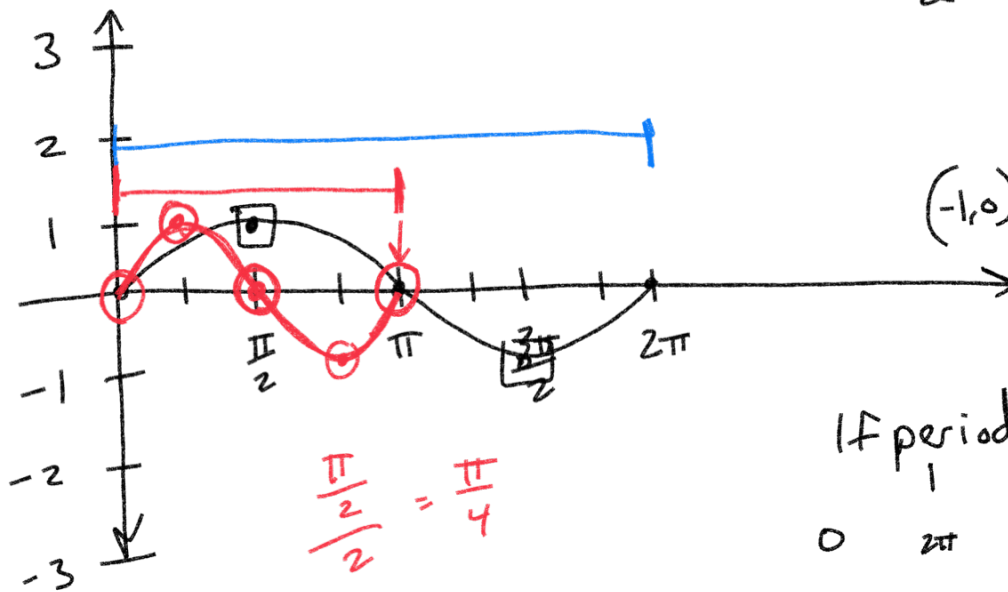
1.)  $y = \sin x$



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

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

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



If period =  $8\pi$

0	$2\pi$	0	$6\pi$	0
		$4\pi$	-1	$8\pi$

### 3.) Horizontal Shift

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

$\uparrow \frac{1}{2}$        $\frac{3\pi}{2}$   
 $\frac{1}{2}$        $\frac{3\pi}{2}$

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

right  $\frac{3\pi}{4}$

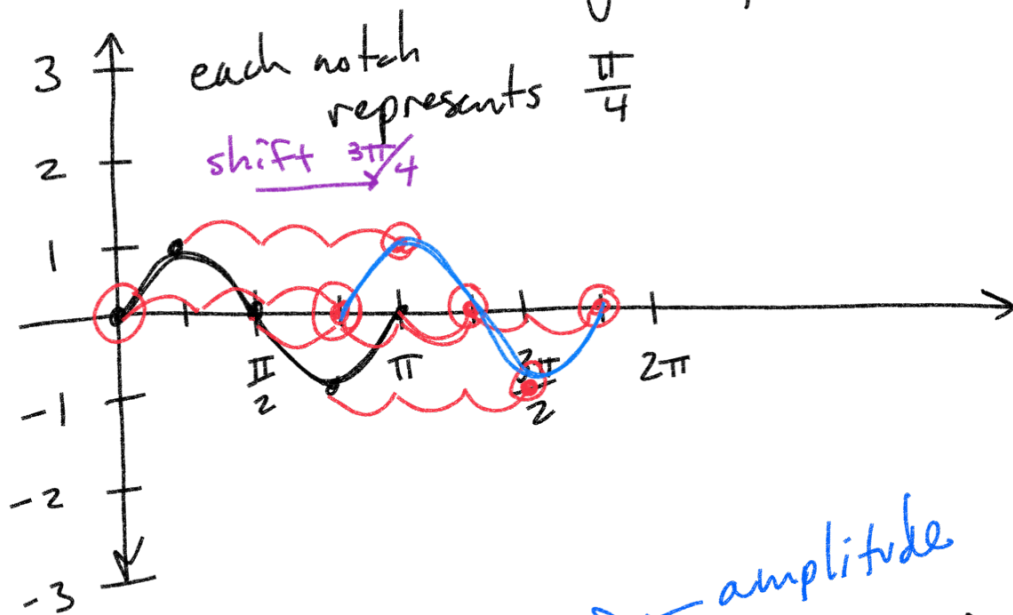
$$\frac{\frac{3\pi}{2}}{2} \div \frac{2}{1} \quad \text{Keep}$$

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

$$\text{Flip}$$

Horizontal shift =  $\frac{3\pi}{4}$

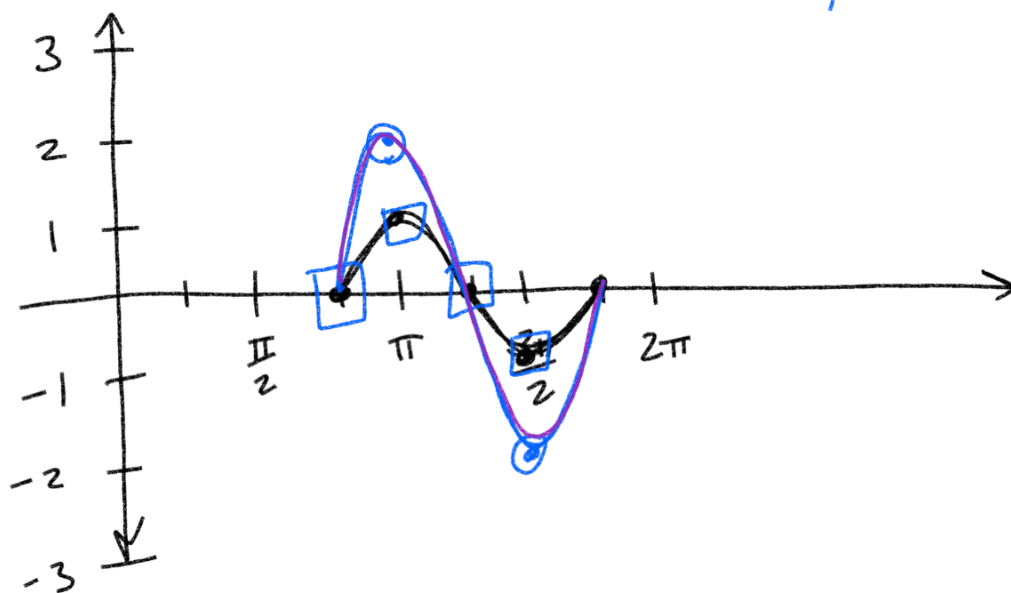
$\sin(2x)$



### 4.) Amplitude

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

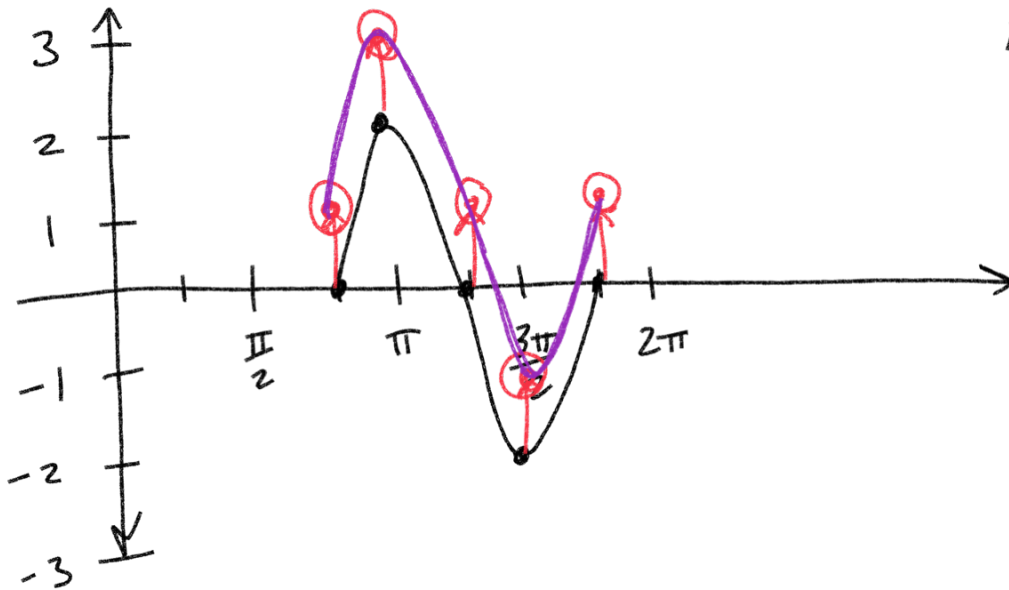
Multiply the "y" by 2



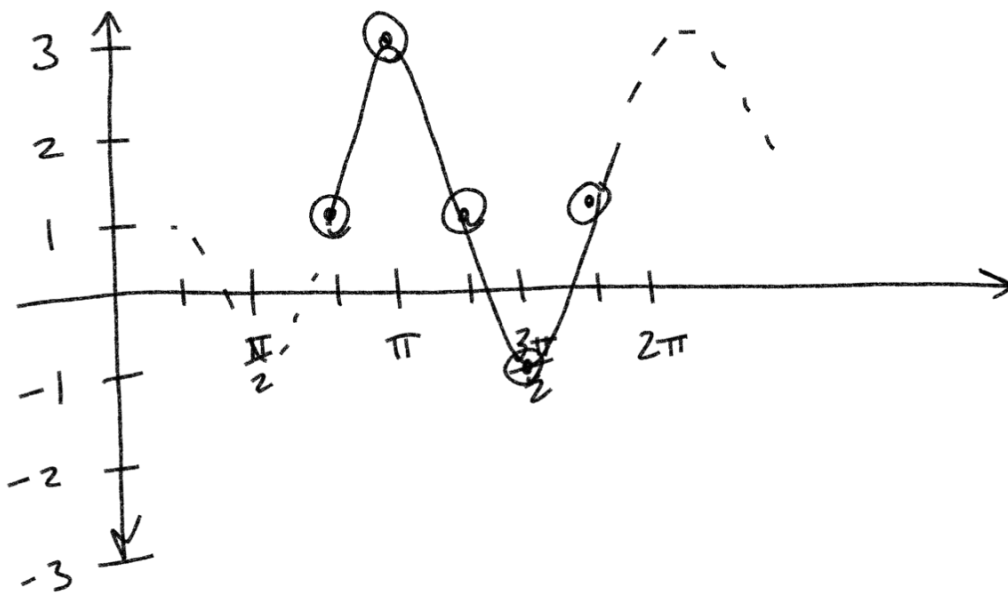
# 5.) Vertical Shift

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

Add 1 to each y



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



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

cos X

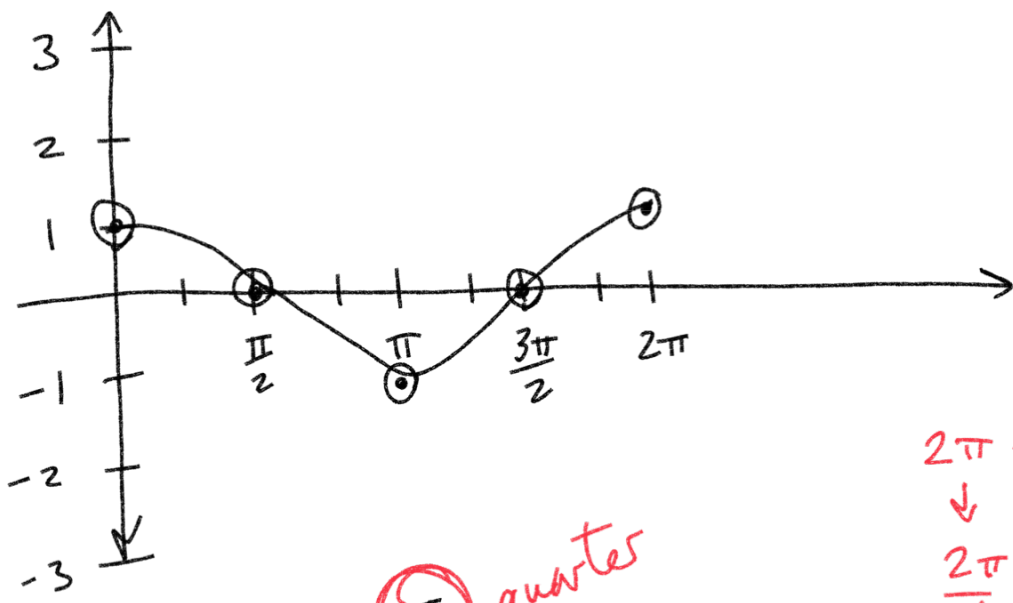
1.) sin/cos wave

2.) period

3.) horizontal shift

4.) amplitude

5.) vertical shift



$$b = \frac{1}{2}$$

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

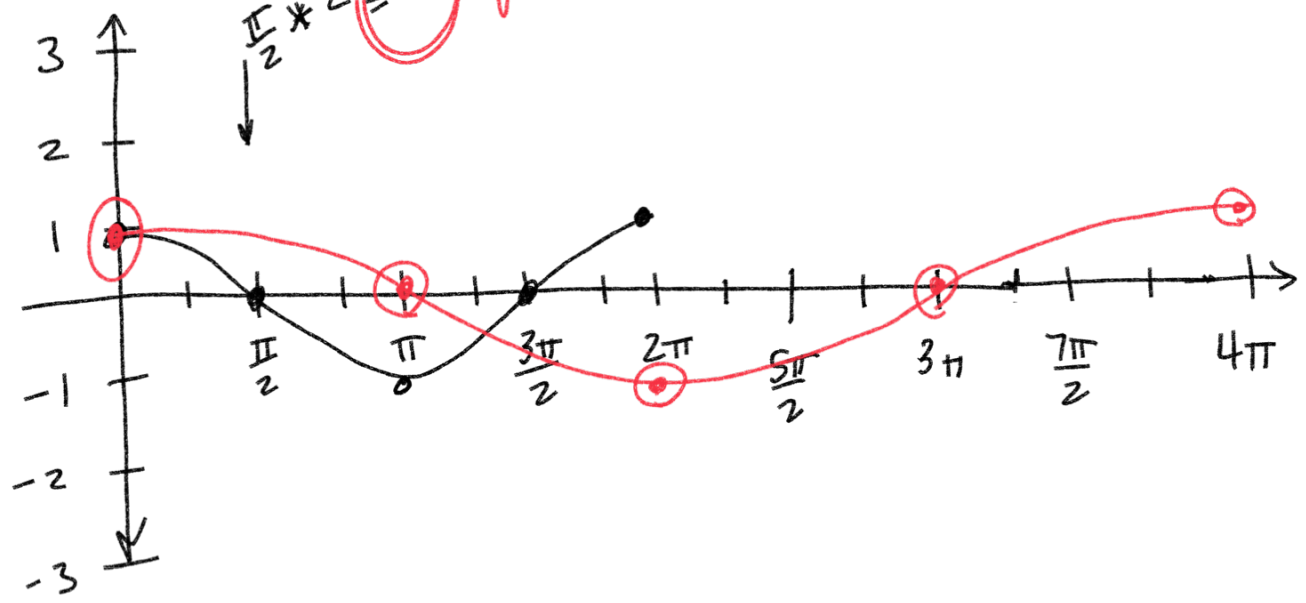
$$2\pi \div \frac{1}{2}$$

$$\downarrow \downarrow \downarrow$$

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

$$= 4\pi$$

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

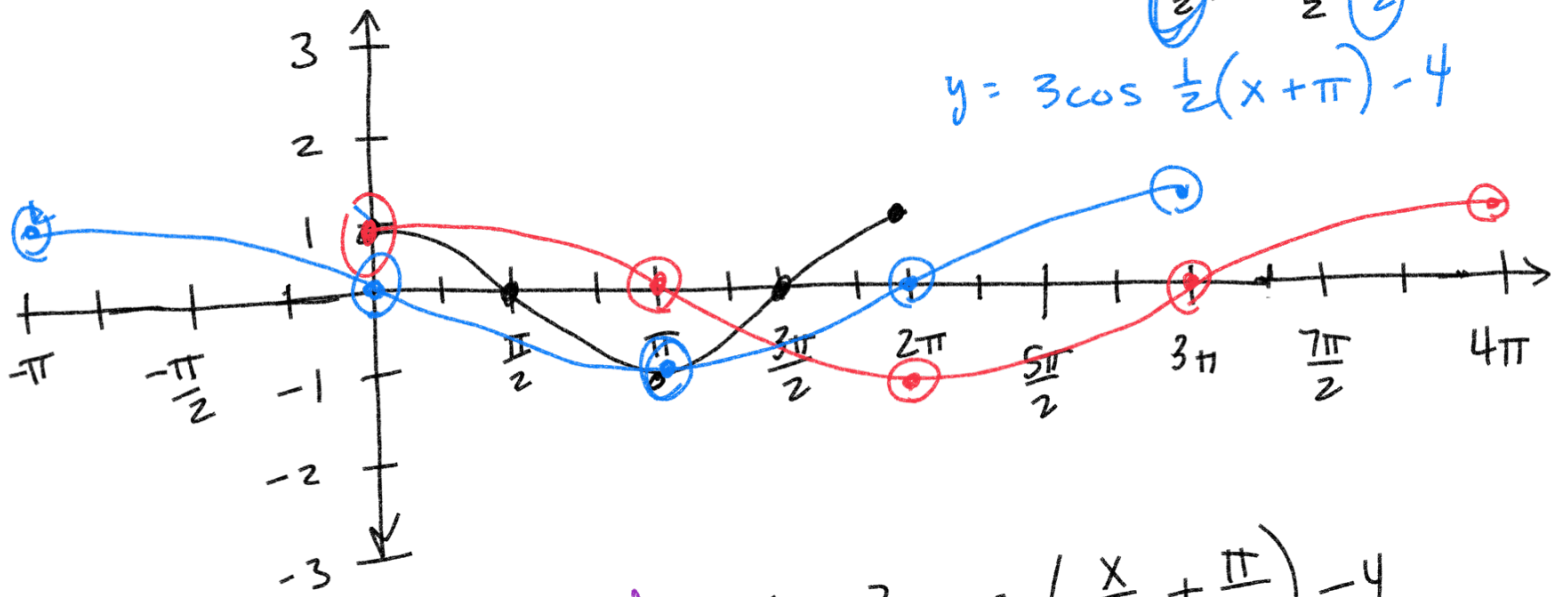


Horizontal shift  
left  $\pi$

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

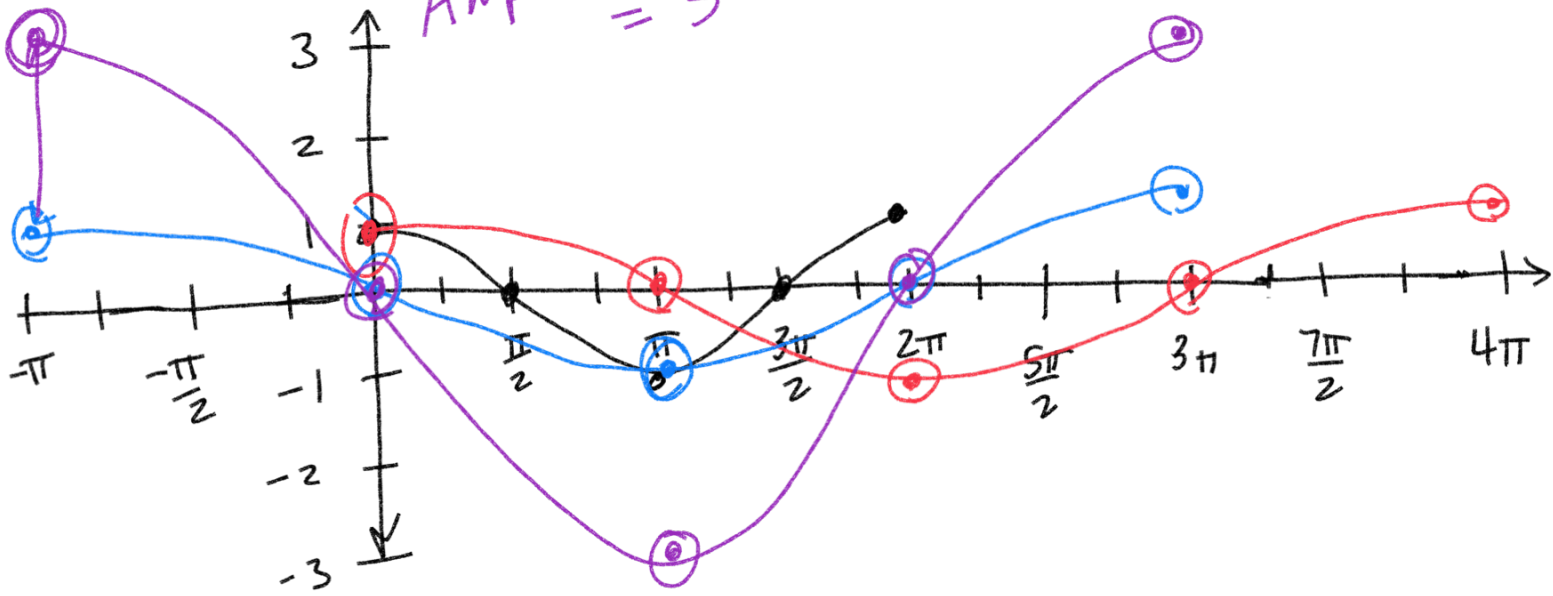
$$\left( \frac{1}{2}x + \frac{\pi}{2} \right) \left( \frac{1}{2}\pi \right)$$

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



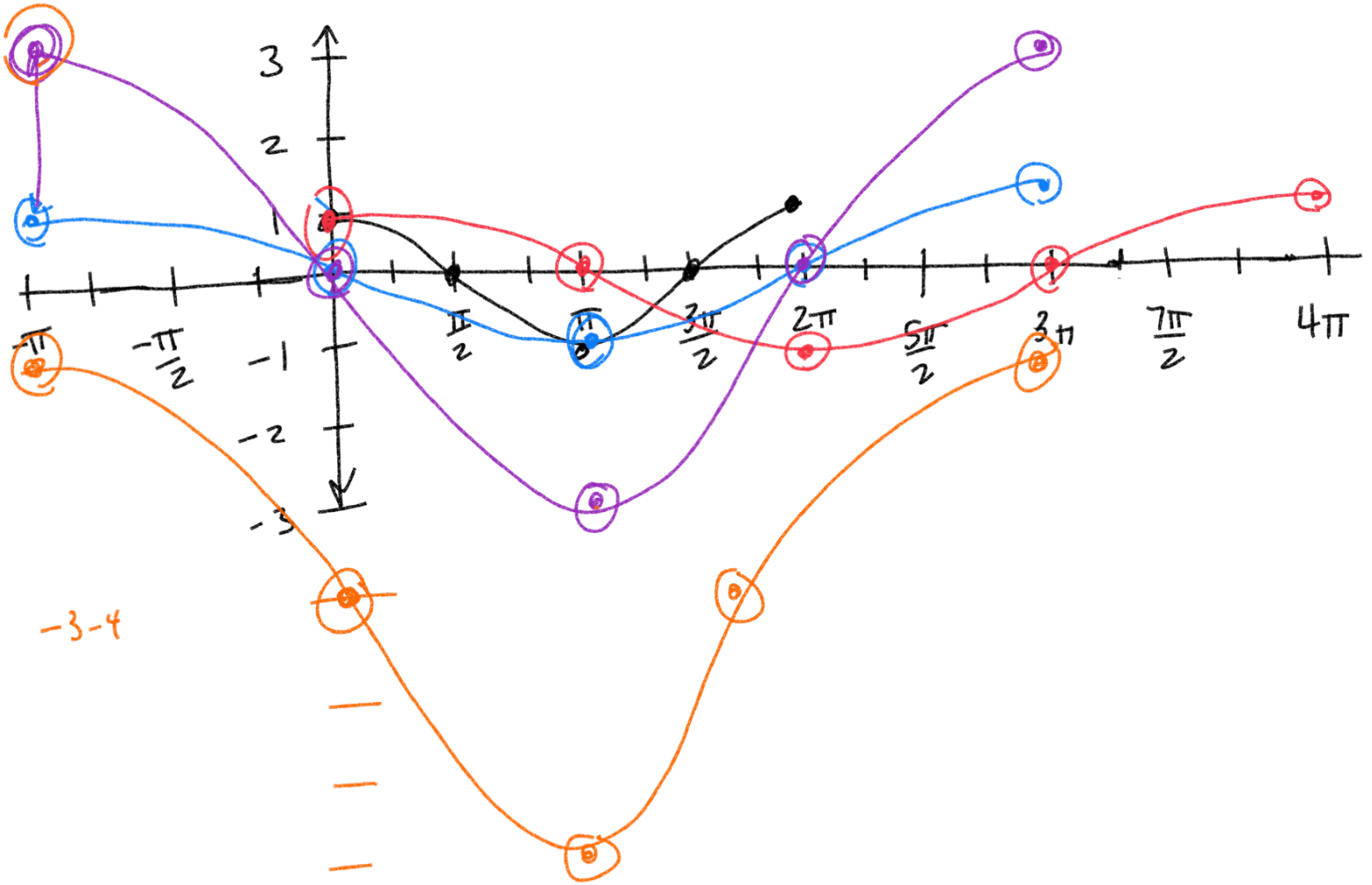
Amplitude = 3

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



Vertical shift  
 $3-4=-1$

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



-3-4