

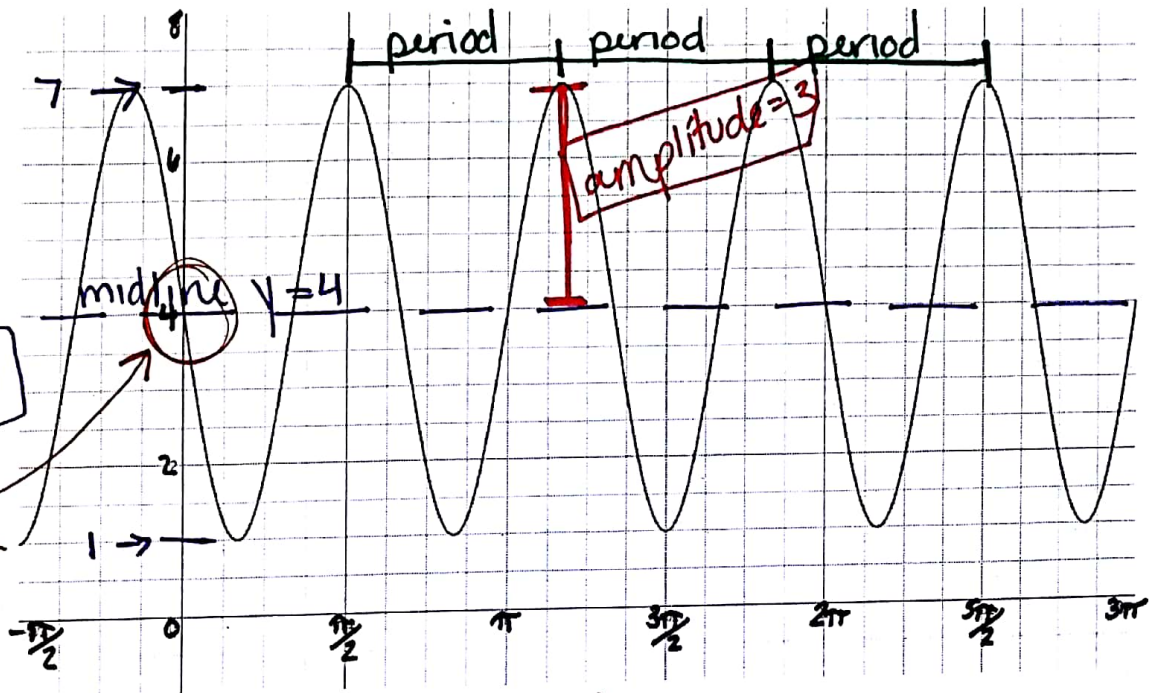
December 18

Amplitude, Period, Vertical Shift and Equations From Graphs

EX1)

$\frac{7+1}{2} = 4$   
 vertical shift: up 4

sine  
 path up:  $a$   
 path down:  $-a$



$$\text{amplitude} = |4 - 7| = 3$$

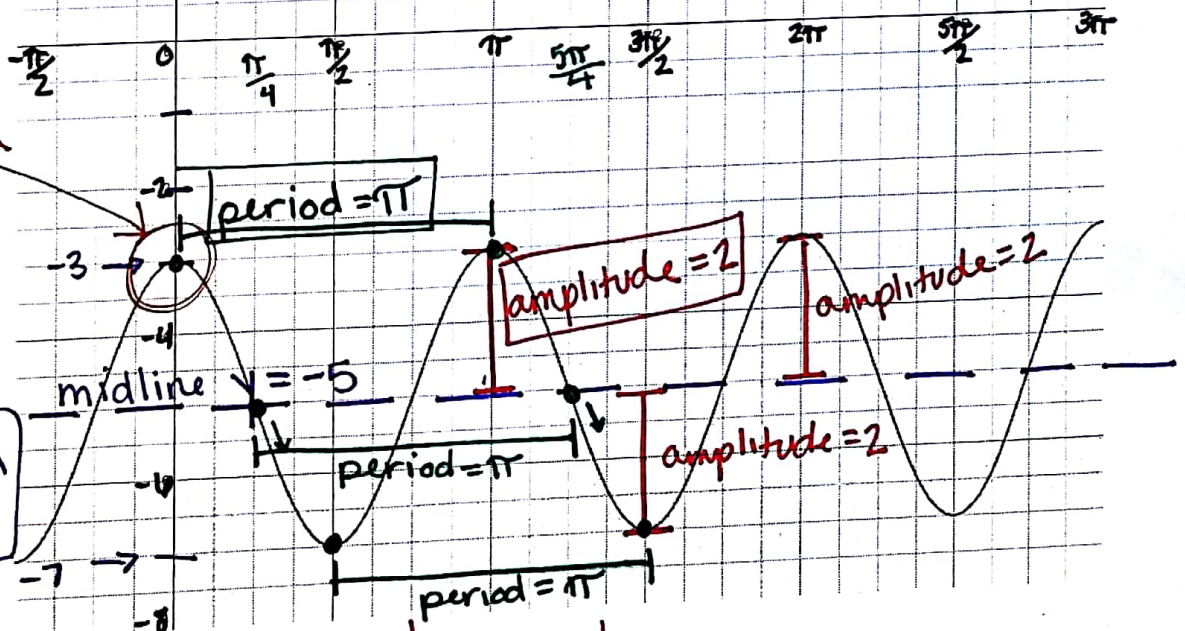
$$\frac{3 \text{ period}}{3} = \left| \frac{\pi}{2} - \frac{5\pi}{2} \right| = \frac{2\pi}{3}$$

$$\text{period} = \frac{2\pi}{3}$$

EX2)

cosine  
 maximum:  $a$   
 minimum:  $-a$

$\frac{-3 + -7}{2} = -5$   
 vertical shift: down 5



$$\text{amplitude} = |-3 - -5| = 2$$

$$\text{period} = |0 - \pi| = \pi$$

# Equations of Sine/Cosine Functions

$$y = a \cdot \sin bx + d$$

amplitude =  $|a|$       period =  $\frac{2\pi}{b}$

vertical shift:  $+d \rightarrow$  up  
 $-d \rightarrow$  down

Ex3  $y = 6 \sin 5x - 8$

amplitude =  $|6|$   
amplitude = 6

period =  $\frac{2\pi}{5}$

vertical shift = down 8

Ex4  $y = -2 \cos \frac{1}{4}x + 1$

amplitude =  $|-2|$   
amplitude = 2

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

vertical shift = up 1

period =  $2\pi \cdot 4$

period =  $8\pi$

Ex5  $y = -1 \sin x + 0$

amplitude =  $|-1|$   
amplitude = 1

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

period =  $2\pi$

vertical shift = none

Back to Ex 1

amplitude = 3

$$\text{period} = \frac{2\pi}{3}$$

vertical shift = up 4

$$|a| = 3$$

$$\frac{2\pi}{b} \times \frac{2\pi}{3}$$

$$d = +4$$

$$a = \pm 3$$

$$2\pi \cdot 3 = b \cdot 2\pi$$

$a = -3$   
(path down)  
sine

$$\frac{6\pi}{2\pi} = \frac{2\pi b}{4\pi}$$
$$3 = b$$

$$y = -3\sin 3x + 4$$

Back to Ex 2

amplitude = 2

$$\text{period} = \pi$$

vertical shift = down 5

$$|a| = 2$$

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

$$d = -5$$

$$a = \pm 2$$

$$2\pi \cdot 1 = \pi \cdot b$$

$a = 2$   
(maximum)  
cosine

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

$$y = 2\cos 2x - 5$$