

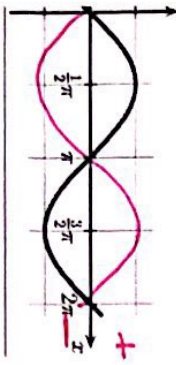
# GUIDED NOTES: Graphs of Sine and Cosine

## Amplitude, Period, Frequency, and Vertical Shift

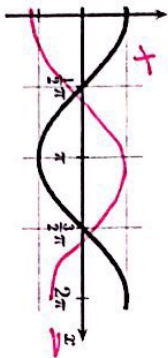
	Definition	How to find on a graph:	How to find in an equation:
amplitude	distance from the midline to a maximum or minimum	count from midline to max	amp =  a
period	how long (how many radians) until the graph repeats	look to see when repeats	$P = \frac{2\pi}{b}$
frequency	how much of the wave happens in one radian	flip period	freq = $\frac{1}{P}$
vertical shift	how far above or below the x-axis the graph was moved (where the midline is)	distance between midline	+d → up -d → down

There is also a such thing as a phase shift. You will learn about it in your next math class.

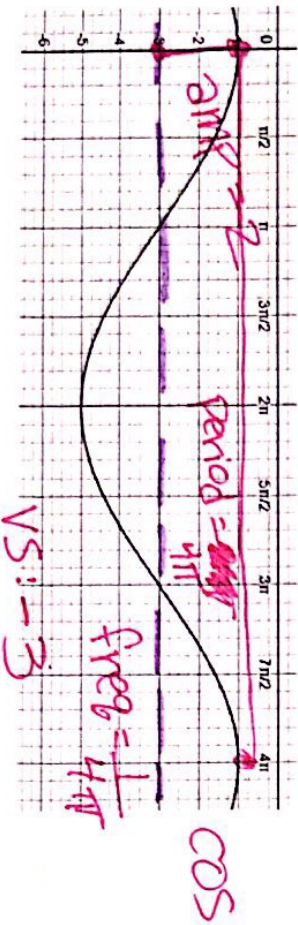
Sine looks like:



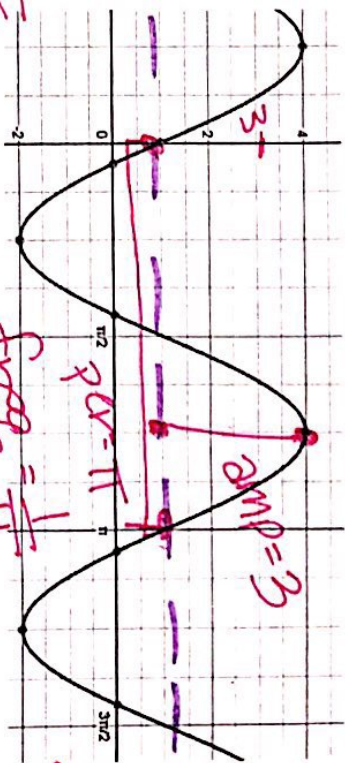
Cosine looks like:



From graphs...  
Ex 1) Determine the amplitude and period of each function. Tell whether it's a sine or cosine function.



Ex 2) Determine the amplitude and period of each function. Tell whether it's a sine or cosine function.



From equations...

Ex 1)  $y = -4\cos(x) + 7$

Amplitude:  $|-4| = 4$

Period:  $\frac{2\pi}{1} = 2\pi$

Frequency:  $\frac{1}{2\pi}$

Vertical Shift:  $up\ 7$

Ex 3)  $y = \sin(x) + 2$

Amplitude:  $1$

Period:  $2\pi$

Frequency:  $\frac{1}{2\pi}$

Vertical Shift:  $up\ 2$

Ex 2)  $y = 6\sin(\frac{1}{3}x) - 4$

Amplitude:  $6$

Period:  $\frac{2\pi}{1/3} = 6\pi$

Frequency:  $\frac{1}{6\pi}$

Vertical Shift:  $down\ 4$

Ex 4)  $y = \frac{1}{2}\cos(\frac{1}{4}x)$

Amplitude:  $\frac{1}{2}$

Period:  $\frac{2\pi}{1/4} = 8\pi$

Frequency:  $\frac{1}{8\pi}$

Vertical Shift:  $none, n/a$

Ex 5) Given an amplitude of 7, a period of  $4\pi$ , and a vertical shift down 3 units, write the equation of the sine function.

$y = 7\sin(\frac{1}{4}x) - 3$

Ex 6) Given an amplitude of 3, a frequency of  $\frac{1}{4\pi}$ , and a vertical shift up 7 units, write the equation of the cosine function.

$y = 3\cos(\frac{1}{4}x) + 7$

$y = -7\sin(\frac{1}{2}x) - 3$

$y = \pm 3\cos(2x) + 7$