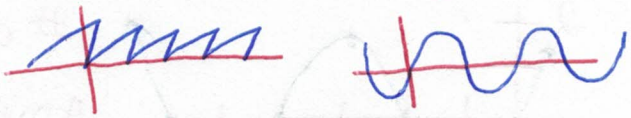
Periodic Functions

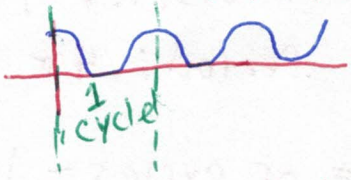
UNIT 6 LESSON ____ INVESTIGATION ____ NOTES

Lesson Vocabulary

Periodic Function – A function whose graph repeats a pattern.

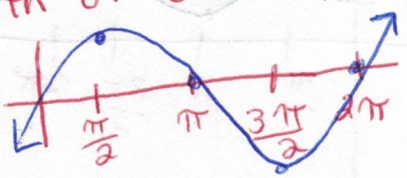


Cycle – One complete pattern. May begin at any point.



Period – The horizontal length of one cycle. Measure along the x-axis.

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



Amplitude – The height of the graph. ½ the difference of the max and min values.

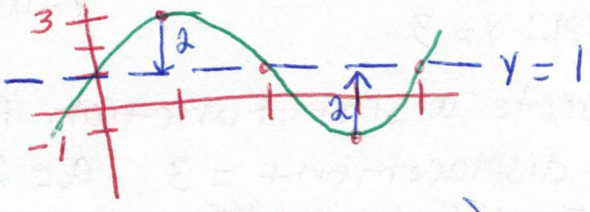
$$\text{Amp} = \frac{1}{2}(\text{max} - \text{min})$$

y-displacement – The location on the y-axis where the amplitude starts. This becomes the new x-axis.

$\text{amp} = \frac{1}{2}(3-(-1)) = \frac{1}{2}(4) = 2$

y-disp. is $y = 1$

(count down 2 from max, up 2 from min)



Write a Sine/Cosine Function

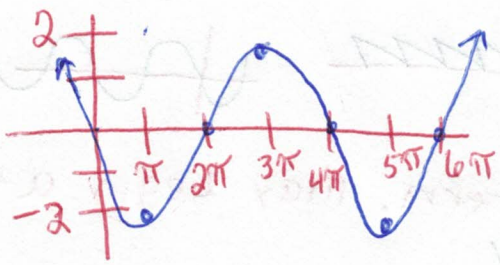
$y = a \sin b\theta + c$ $\quad y = a \cos b\theta + c$

a – amplitude, b – # of cycles from 0 to 2π, c – y-displacement

1. Calculate b from period given using $\text{Period} = \frac{2\pi}{b}$
2. Plug in a, b and c into function form.

Example Problem(s)

ex.) Determine the # of cycles from 0 to 2π. Then find the amplitude, period and y-displacement

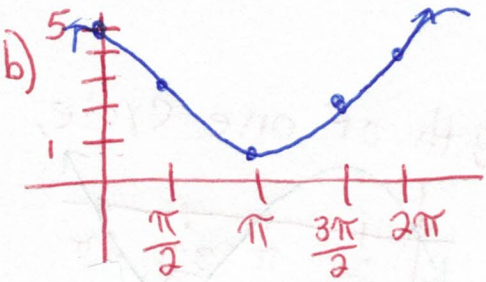
a) 

# of cycles = $\frac{1}{2}$

Amp = $\frac{1}{2}(2-(-2)) = \frac{1}{2}(4) = 2$

y-displ.: $y = 0$ (use amp. count from max/min)

Period: 4π (length of one cycle)

b) 

# of cycles = 1

Amp = $\frac{1}{2}(5-1) = \frac{1}{2}(4) = 2$

y-displ: $y = 3$

Period: 2π

ex.) Find amplitude, Period and y-displacement.

a) $y = 5 \sin 2\theta + 3$

$y = a \sin b\theta + c$

amp = 5

Find Period: $P = \frac{2\pi}{b}$

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

$P = \pi$

y-displ.: $y = 3$

b) $y = 5 \cos \theta - 4$

$y = a \cos b\theta - 4$

amp = 5

Find period: $P = \frac{2\pi}{b}$

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

$P = 2\pi$

y-displ.: $y = -4$

ex.) Write a sine Function For amplitude = 2, Period = π, y-displacement = 3

$a = 2$, $c = 3$

Find b: $P = \frac{2\pi}{b}$

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

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

$b = 2$

$y = 2 \sin 2\theta + 3$

ex.) Write a cosine Function for amplitude = 1, Period = 2π

Find b: $P = \frac{2\pi}{b}$

$a = 1$, $c = 0$

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

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

$y = 1 \cos \theta$