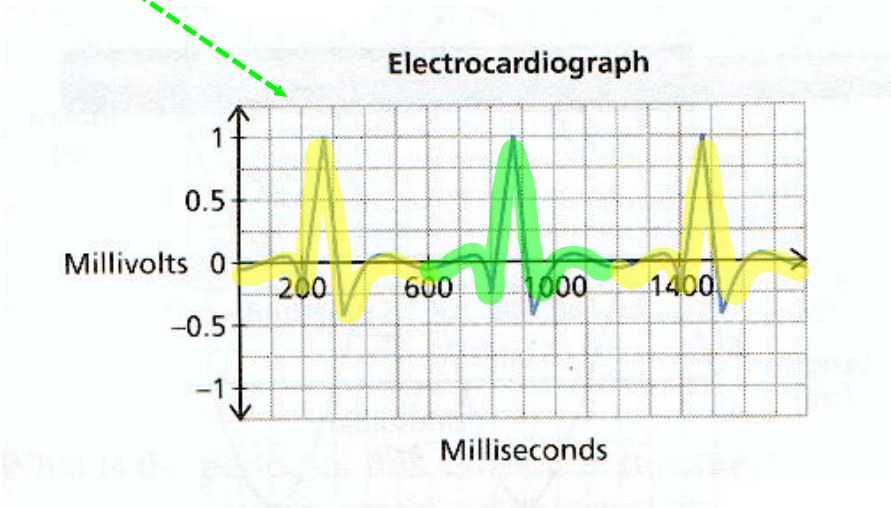
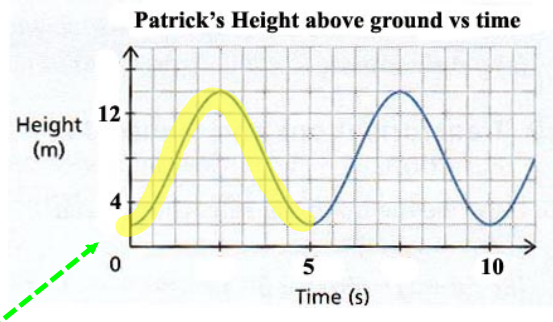
Remember!

Periodic Functions Repeat!



Sinusoidal Function: A periodic function that looks like waves, where any portion of the curve can be translated onto another portion of the curve.

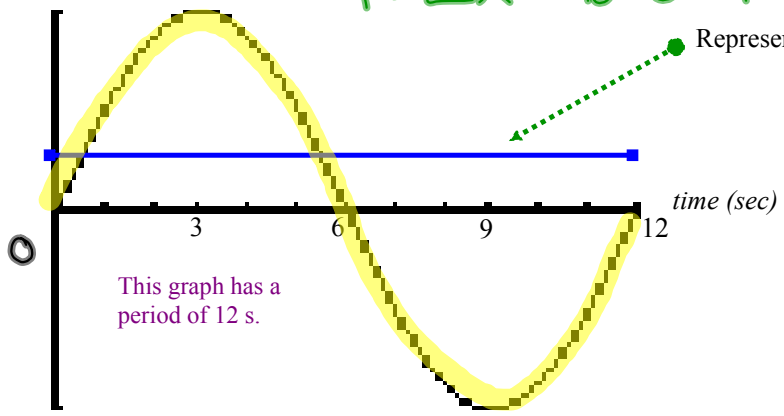


Repeats and looks like waves!

I. Period: The change in x corresponding to one cycle.

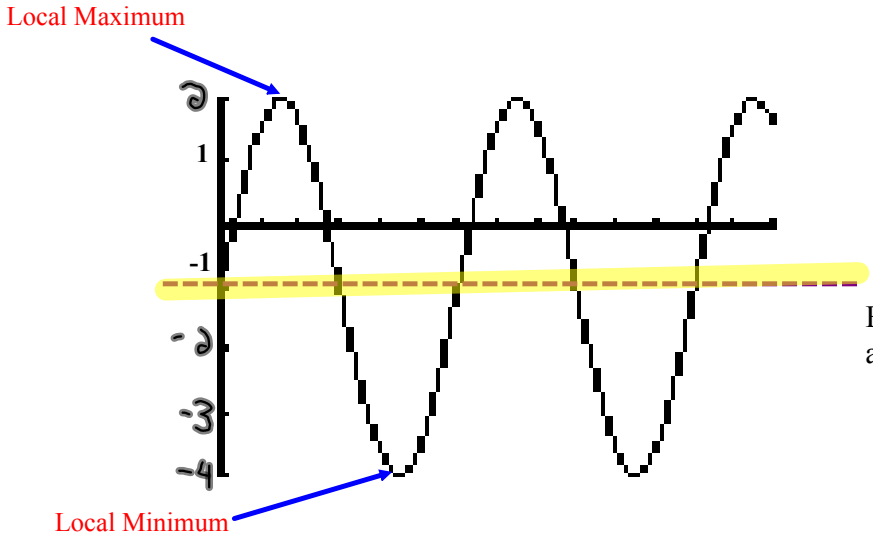
$P = \Delta x = 12 - 0 = 12$

$k = \frac{360}{12} = 30$

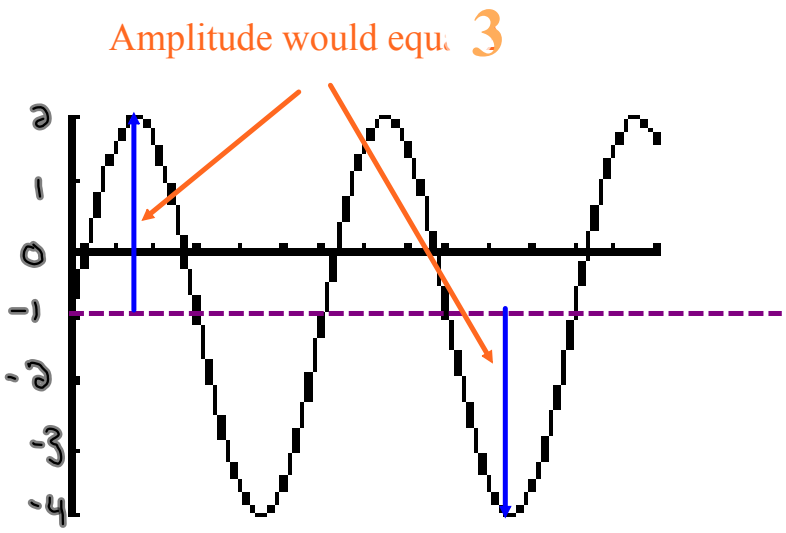


II. Sinusoidal Axis: The horizontal line halfway between the local maximum and local minimum.

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



III. Amplitude: The vertical distance from the sinusoidal axis to a local maximum or local minimum. (Positive)



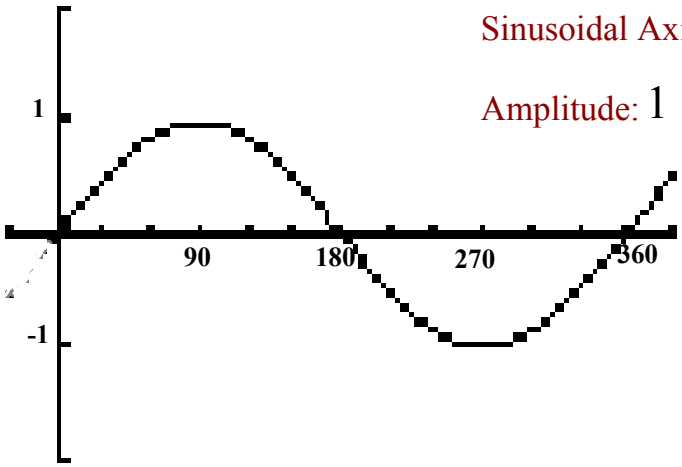
Summarize...

Here is the graph of $y = \sin\theta$

Period : 360

Sinusoidal Axis: $y = 0$

Amplitude: 1

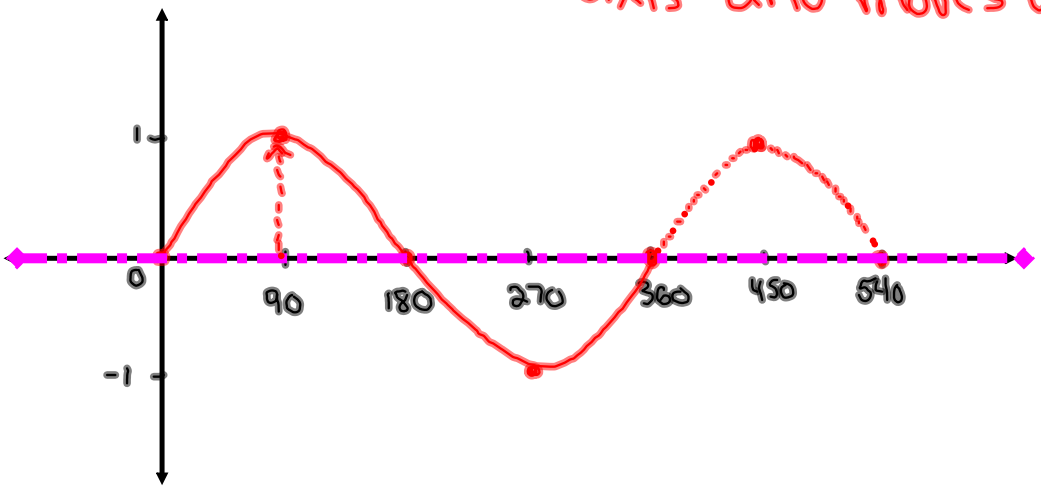


Let's examine the graph of $y = \sin\theta$ or $y = \sin x$

x	0	30	60	90	120	150	180	210	240	270	300	330	360
y	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0

Now plot the above points...

Starts on the sinusoidal axis and moves up



Is this a sinusoidal function? Yes

Find:

Amplitude = 1

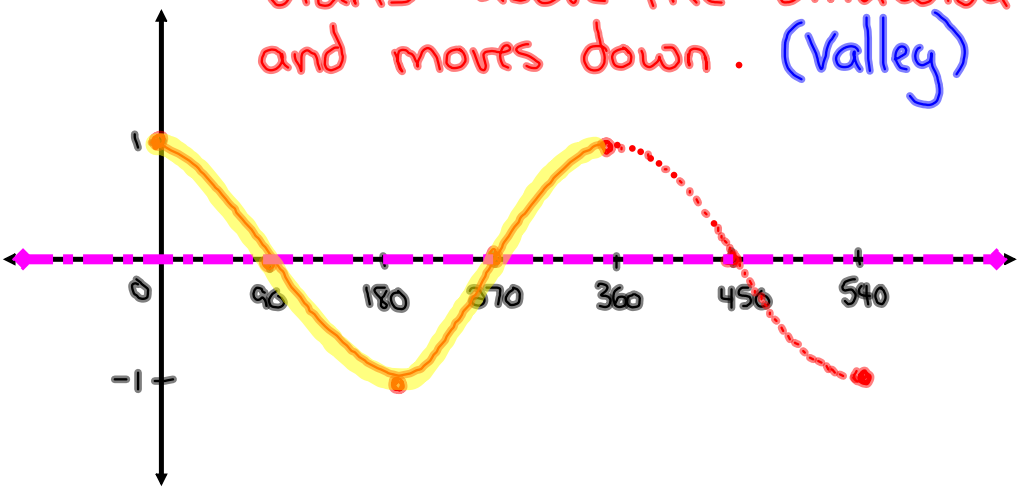
Period = 360

Equation of Sinusoidal Axis : $y = 0$

What about $y = \cos\theta$? or $y = \cos x$

θ	0	30	60	90	120	150	180	210	240	270	300	330	360
y	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1

Starts above the sinusoidal axis and moves down. (Valley)



Is this a sinusoidal function? Yes

Find:

Amplitude = 1

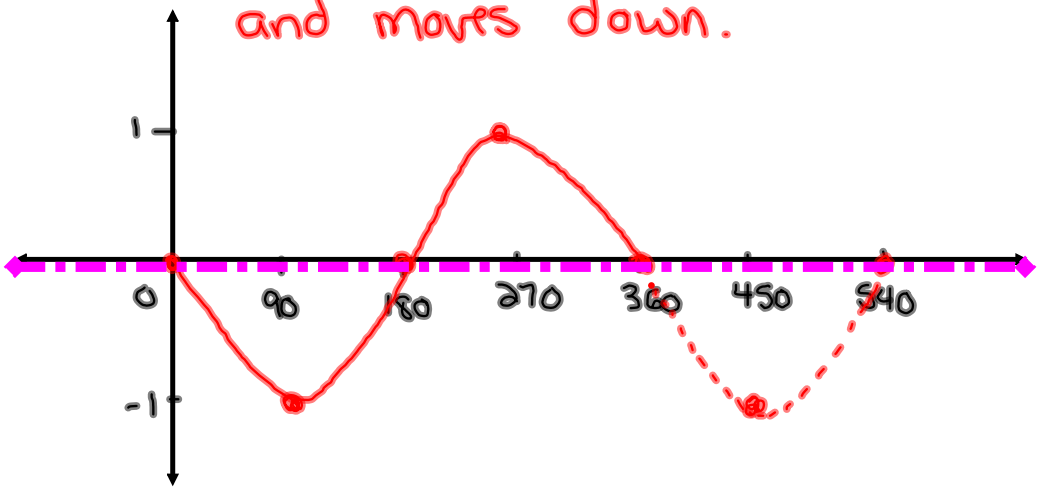
Period = 360

Equation of Sinusoidal Axis: $y = 0$

What about $y = -\sin x$

x	0	90	180	270	360
y	0	-1	0	1	0

Starts on the sinusoidal axis and moves down.



Is this a sinusoidal function? Yes

Find:

Amplitude = 1

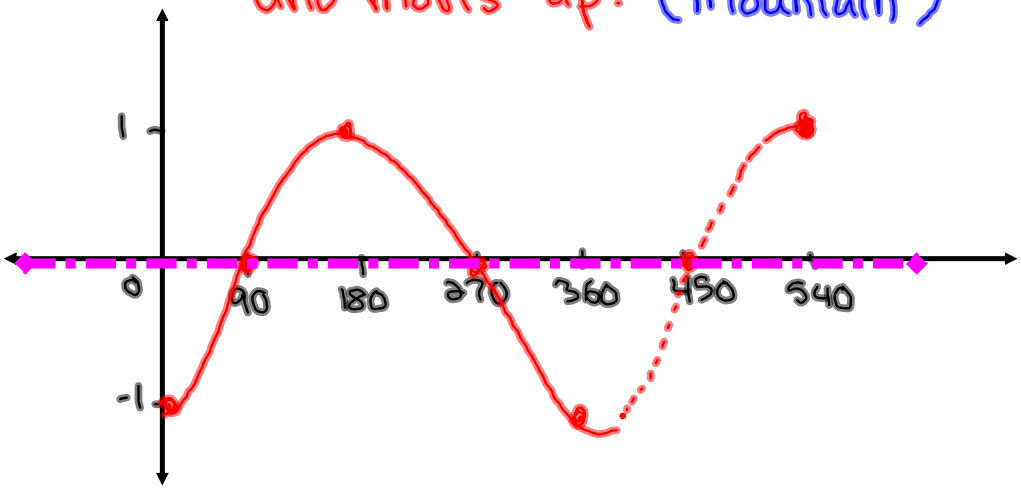
Period = 360

Equation of Sinusoidal Axis: $\therefore y=0$

What about $y = -\cos x$

x	0	90	180	270	360
y	-1	0	1	0	-1

Starts below the sinusoidal axis and moves up. (Mountain)



Is this a sinusoidal function? Yes

Find:

Amplitude = 1

Period = 360

Equation of Sinusoidal Axis : $y=0$

Equations in Standard Form

$$y = A\sin[k(x - C)] + D$$

A = ***Amplitude*** → influences how tall the sine curve is.

K = $\frac{360}{P}$ → influences how often the pattern repeats.

C = ***Horizontal Translation*** → Influences how far to the left or the right that the graph will shift.

- If C is positive → Shift Left
- If C is negative → Shift Right

D = ***Vertical Translation*** → influences how far up and down the graph will shift.

- If D is positive → Shift Up
- If D is negative → Shift Down
- Equal to your sinusoidal Axis

① a) $y = -3\sin[1(x+60)] + 0$

$A = 3$ $\quad C = -60$ $\quad P = \frac{360}{k} = \frac{360}{1} = 360$

$K = 1$ $\quad D = 0$

h) $2y + 2 = 4\cos(x-90) - 6$ $\quad -2$

$\frac{2y}{2} = \frac{4}{2}\cos[1(x-90)] - \frac{8}{2}$

$y = 2\cos[1(x-90)] - 4$

$A = 2$ $\quad C = 90$ $\quad P = \frac{360}{k} = \frac{360}{1} = 360$

$K = 1$ $\quad D = -4$

b) $y = 2\cos\left[\frac{1}{2}(x)\right]$

$A = 2$ $\quad C = 0$ $\quad P = \frac{360}{k} = \frac{360}{1/2} = 720$

$K = 1/2$ $\quad D = 0$

e) $y = \sin(2x-60)$

$y = \sin[2(x-30)]$

$A = 1$ $\quad C = 30$ $\quad P = \frac{360}{k} = \frac{360}{2} = 180$

$K = 2$ $\quad D = 0$

① a) $y = -3\sin(x+60)$

$y = -3\sin[1(x+60)] + 0$

$A = 3 \quad K = 1 \quad C = -60 \quad D = 0$

$P = \frac{360}{K} = \frac{360}{1} = 360$ Equation of sin axis: $y = 0$

e) $y = \sin(2x-60)$

$y = 1\sin[2(x-30)] + 0$

$A = 1 \quad K = 2 \quad C = 30 \quad D = 0$

$P = \frac{360}{2} = 180$

	A	K	P	C	D
b)	2	$\frac{1}{2}$	720	0	0
c)	2	2	180	-30	0
d)	4	$\frac{3}{4}$	480	90	-2
e)	1	2	180	30	0
f)	3	36	10	10	1
g)	2	1	360	-60	-5
* h)	2	1	360	90	-4

h) $2y + 2 = 4\cos[1(x-90)] - 6$

$\frac{2y}{2} = \frac{4\cos[1(x-90)]}{2} - \frac{8}{2}$

$y = 2\cos[1(x-90)] - 4$