Today's Learning Goal(s):

Date: _____

By the end of the class, I will be able to:

a) interpret and describe periodic functions.

b) understand the properties and characteristics of sinusoidal functions.

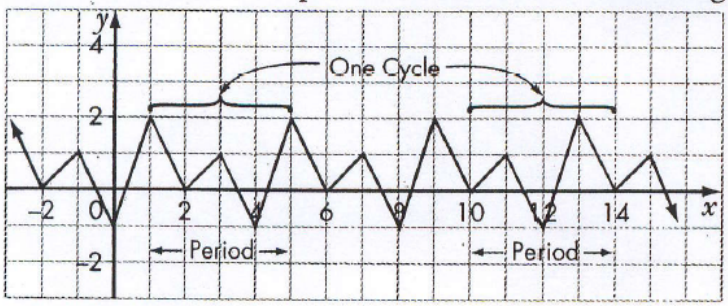
Last day's work: p. 344 #1 – 7

6.1 Periodic Functions and Their Properties

Date: Dec.2/15

There are many examples of periodic behaviour in nature. Familiar examples include the rising and setting of the sun, and the rise and fall of tides. The rhythm of the human heartbeat also follows a periodic pattern. Less obvious examples include the motion of sound waves and light waves. Even the populations of some animal species show a periodic pattern in the way they increase and decrease over time.

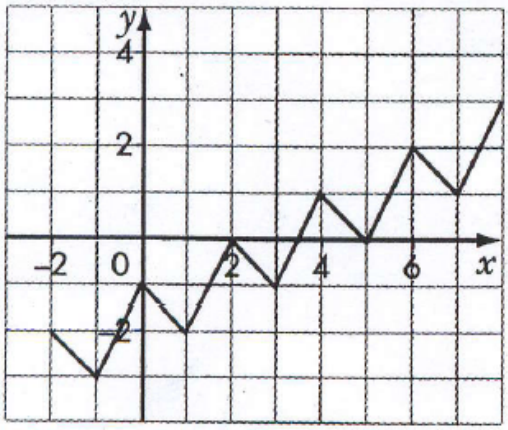
A function is **periodic** if it has a pattern of y-values that repeats at regular intervals. One complete pattern is called a **cycle**. A cycle may begin at any point on the graph. The horizontal length of one cycle is called the **period** of the function. The period of the function in the graph shown is 4 units.



Ex.1

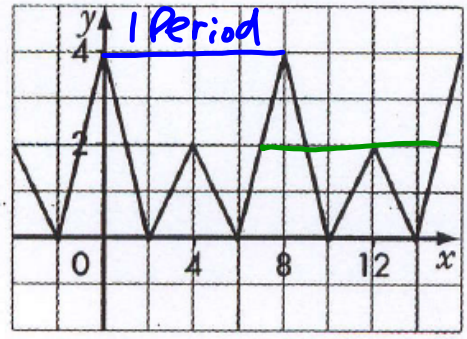
Determine whether each function is periodic. If it is, state the period.

a)



SOLUTION NOT Periodic

b)

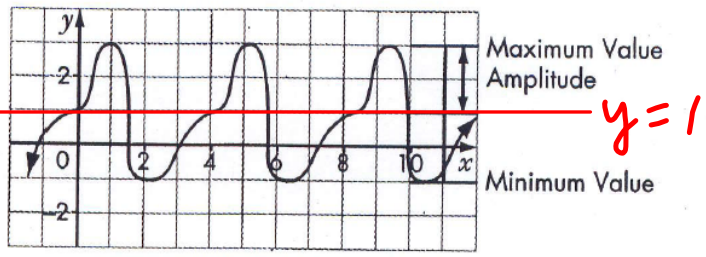


Yes periodic

period is 8 units

In any periodic function, the **amplitude** of the function is defined as half the difference between the maximum value of the function and the minimum value of the function.

For the function shown, the maximum value is 3 and the minimum value is −1.



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

Note that the amplitude is always positive.

$\frac{\text{Max} - \text{Min}}{2}$

The amplitude of this function is 2.

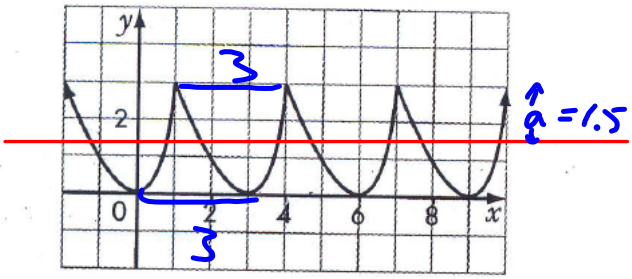
The equation of the axis is $y = 1$ above

Ex.2

Determine if the function is periodic. If it is, state the period and the amplitude.

Periodic

(a)



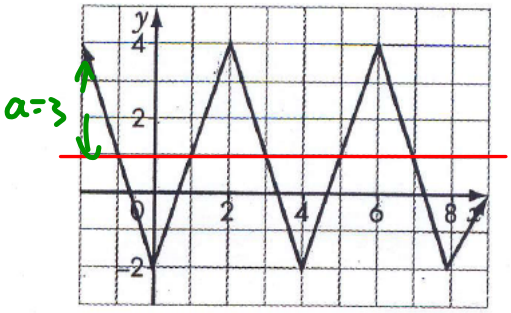
Period = 3 units

Amplitude = $\frac{3-0}{2}$

$= 1.5$

Periodic

(b)



Period = 4 units

Amplitude = $\frac{4-(-2)}{2}$

$= \frac{6}{2}$

$= 3$

6.2 Sinusoidal Functions and Their Properties

Date: Dec-2/15

A sinusoidal function is a periodic function whose graph looks like smooth symmetrical waves. Any portion of the wave can be horizontally translated onto another portion of the curve.

The sinusoidal functions are $y = \sin x$ and $y = \cos x$

Ex. 1 The graph of the function $f(x) = 4\sin(3x) + 2$ is shown below.
Determine if the function is periodic and sinusoidal.
Then determine the period, equation of the axis, the amplitude, domain & range.

Yes it is periodic and sinusoidal.

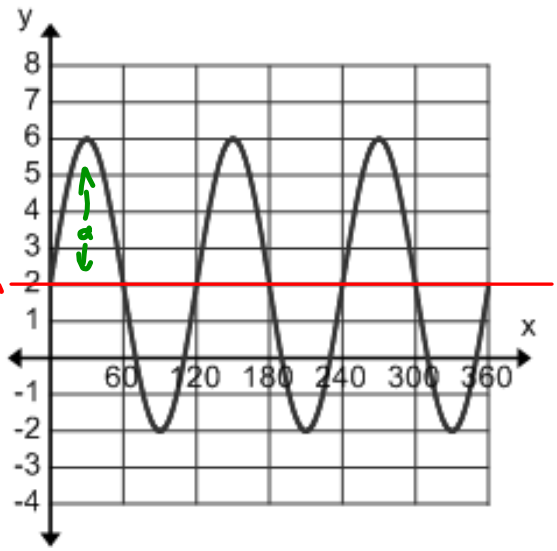
Period = $120°$

Equation of Axis = $y = 2$

Amplitude = 4 $\left(\frac{6-(-2)}{2}\right) = \frac{8}{2} = 4$

Domain = $\{x \in \mathbb{R}\}$

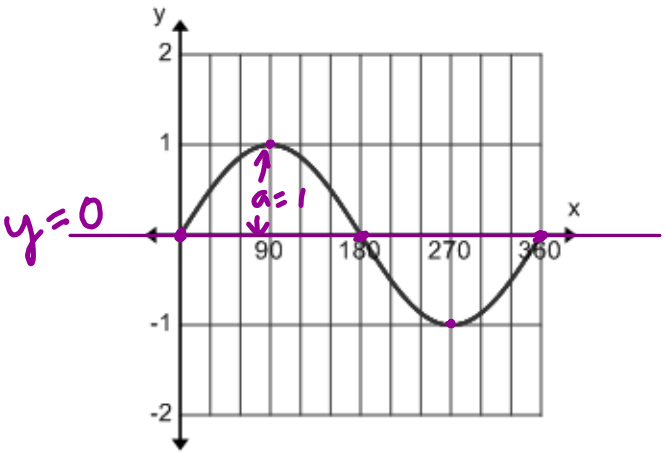
Range = $\{y \in \mathbb{R} \mid -2 \le y \le 6\}$



YOU NEED TO KNOW THIS AND RECITE IT IN YOUR SLEEP!!!

For $y = \sin x$

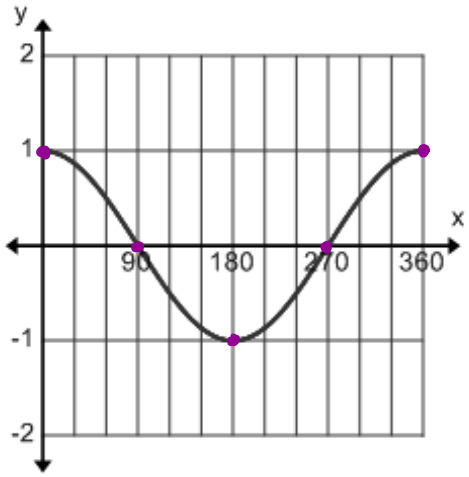
Period = **360°**
Amplitude = **1**
Equation of Axis : **y = 0**
Max value = **1**
Min value = **-1**
Domain = **{xεR}**
Range = **{yεR | -1 ≤ y ≤ 1}**
Zeros are located at: **0°, 180°, 360°, ...**



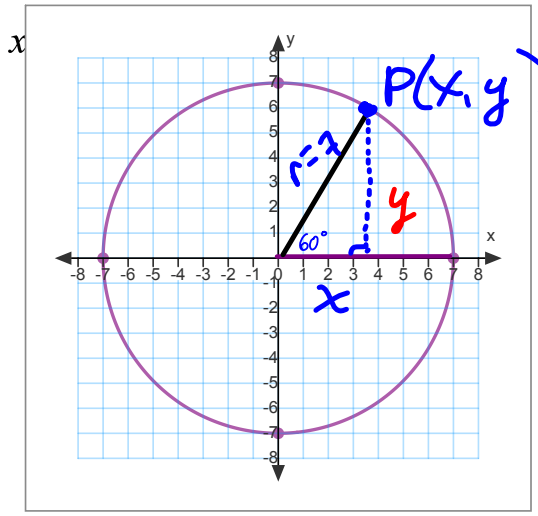
YOU NEED TO KNOW THIS AND RECITE IT IN YOUR SLEEP!!!

For $y = \cos x$

Period = **360°**
Amplitude = **1**
Equation of Axis : **y = 0**
Max value = **1**
Min value = **-1**
Domain = **{xεR}**
Range = **{yεR | -1 ≤ y ≤ 1}**
Zeros are located at: **90°, 270°, 450°, ...**



Ex. 2 Find the coordinates of P(x, y) after a rotation of 60^0 about the origin from the point (7, 0).



What do we know?

$r = 7$ units

$\cos = \frac{adj}{hyp}$

CXR

$\cos 60^\circ = \frac{x}{r}$

$\cos 60^\circ = \frac{x}{7}$

$x = 7\cos 60^\circ$

SYR

$\sin 60^\circ = \frac{y}{7}$

$y = 7\sin 60^\circ$

$\therefore P(x, y)$

$= P(7\cos 60^\circ, 7\sin 60^\circ)$

In general, $P(x, y) = (r\cos\theta, r\sin\theta)$

Are there any Homework Questions you would like to see on the board?

Last day's work: p. 344 #1 – 7

Today's Homework Practice includes:

pp. 352-355 #1 – 8

pp. 363-364 #1 – 4, 9 [15,16]