Today's Learning Goal(s):

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

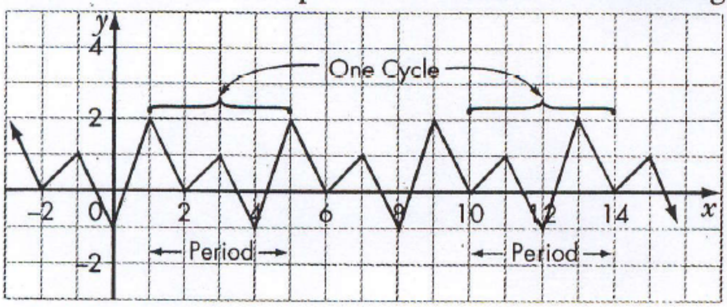
a) interpret and describe periodic functions.

6.1 Periodic Functions and Their Properties

Date: May 13/19

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.

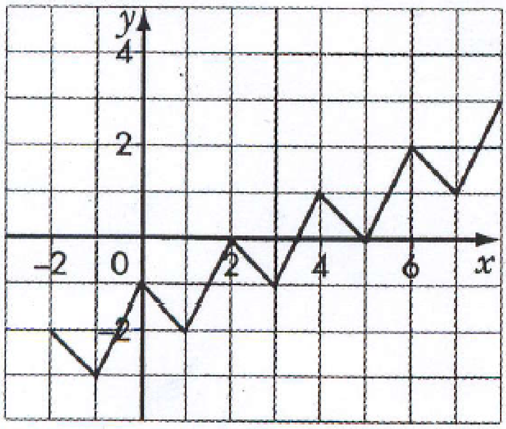
A function is **periodic** if it has a pattern of y-values that repeats at regular intervals. One complete pattern is called a **cycle.** A cycle may begin at any point on the graph. The horizontal length of one cycle is called the **period** of the function. The period of the function in the graph shown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



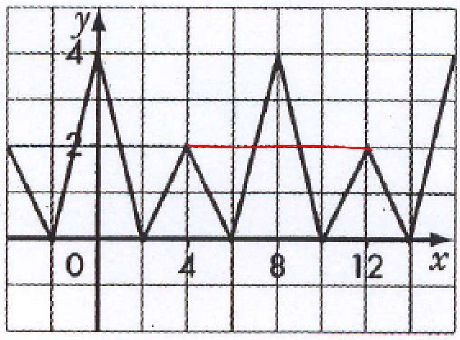
Ex.1

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

a)



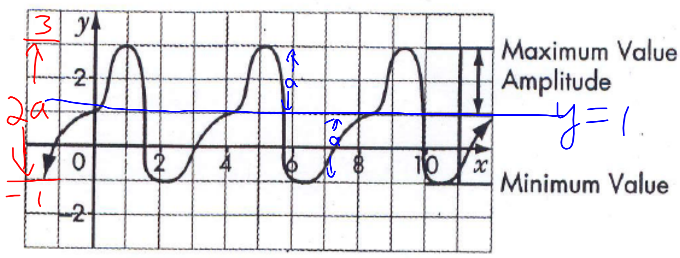
b)



b) yes, periodic
period is 8 units

SOLUTION a) Not periodic

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.

$2a = 4$
$\therefore a = 2$

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

Note that the amplitude is always positive.

The amplitude of this function is 2.

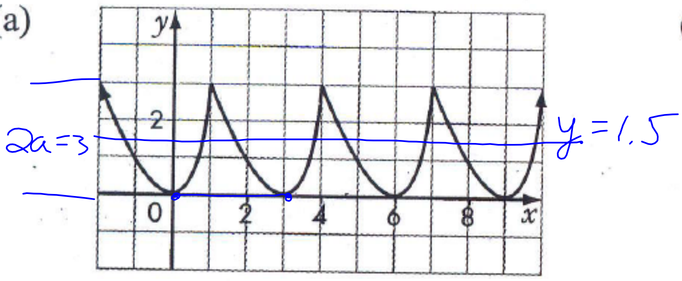
The equation of the axis is $y = 1$

Ex.2

Determine if the function is periodic.

If it is, state the period, the amplitude, and the equation of the axis.

(a)



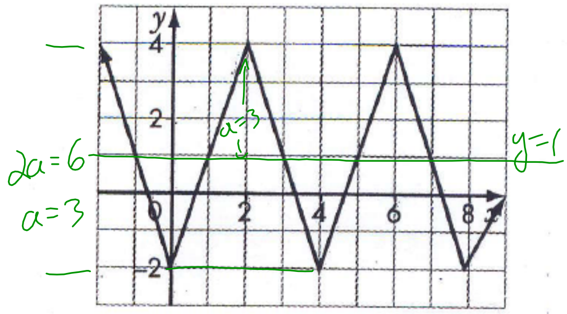
Yes, periodic

period = 3 units

amplitude = 1.5 units

equation of the axis: $y=1.5$

(b)



Yes, periodic

period = 4 units

amplitude = 3

equation of the axis: $y=1$

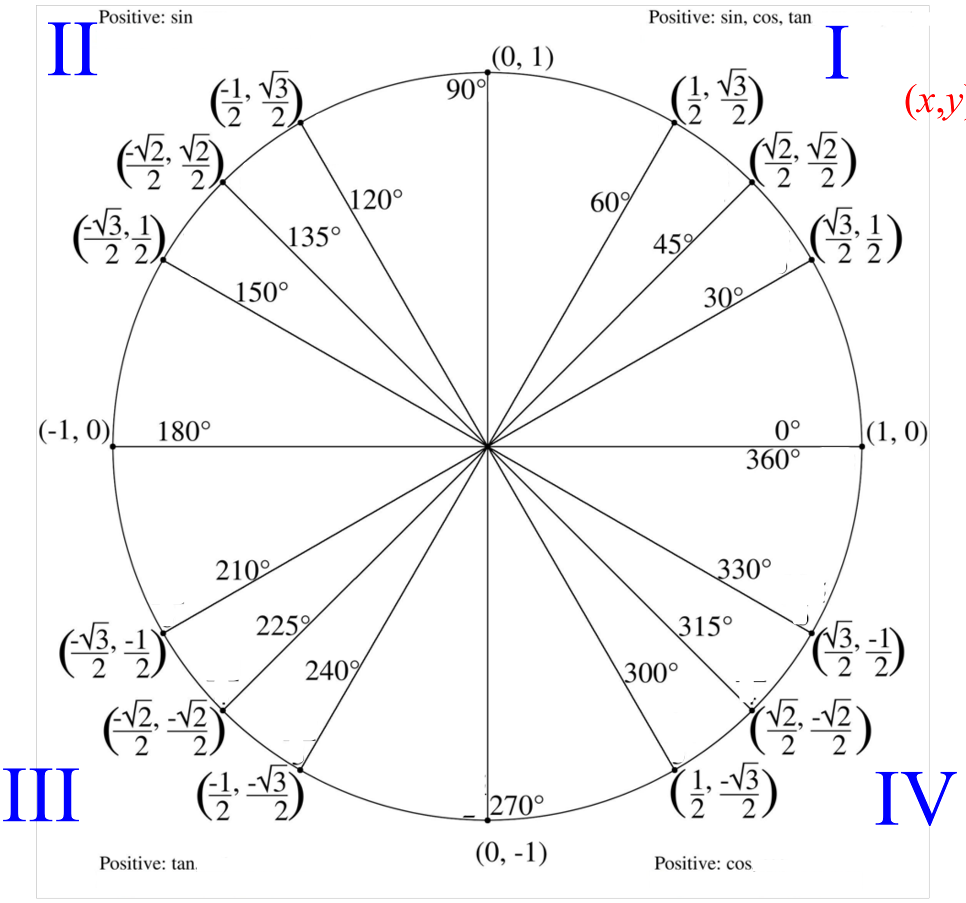
Today's Learning Goal(s):

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

a) use the unit circle to develop the sine and cosine functions.

The Unit Circle

Date: May 13/19



$(x,y) = (\cos\theta, \sin\theta)$

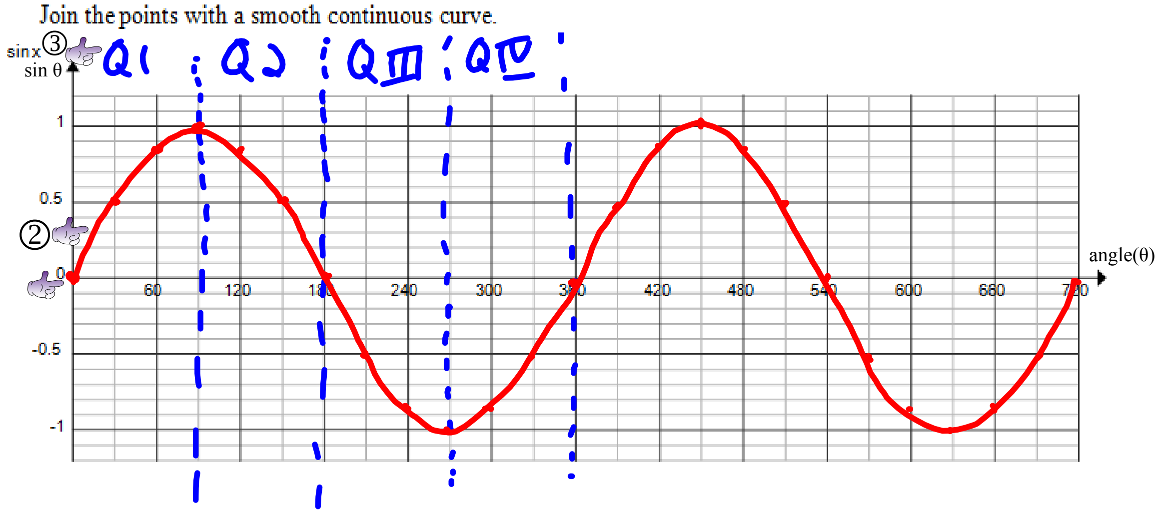
Developing the Sine Function: $y = \sin \theta$ (or $y = \sin x$)

Sine is distance from the ***x*-axis** on the Unit Circle.

1. Complete the table.

Angle θ (°)	0	30	60	90	120	150	180	210	240	270	300	330	
Exact value of *y* (sinθ)	0	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{2}$	
Decimal value of *y* (2 decimal places)	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	
	360	390	420	450	480	510	540	570	600	630	660	690	720
Exact value of *y* (sinθ)	0	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{2}$	0
Decimal value of *y* (2 decimal places)	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0

2. Use the decimal values of sinθ, and plot the ordered pairs (θ, sinθ) on the grid below. **[same as graphing (*x*, sin *x*)]** Join the points with a smooth continuous curve.



For 1 period $0^\circ \le \theta \le 360^\circ$

Increasing Interval: $0^\circ \le \theta \le 90^\circ$, $270^\circ \le \theta \le 360^\circ$

Decreasing Interval: $90^\circ \le \theta \le 270^\circ$

Developing the Cosine Function: $y = \cos\theta$ (or $y = \cos x$)

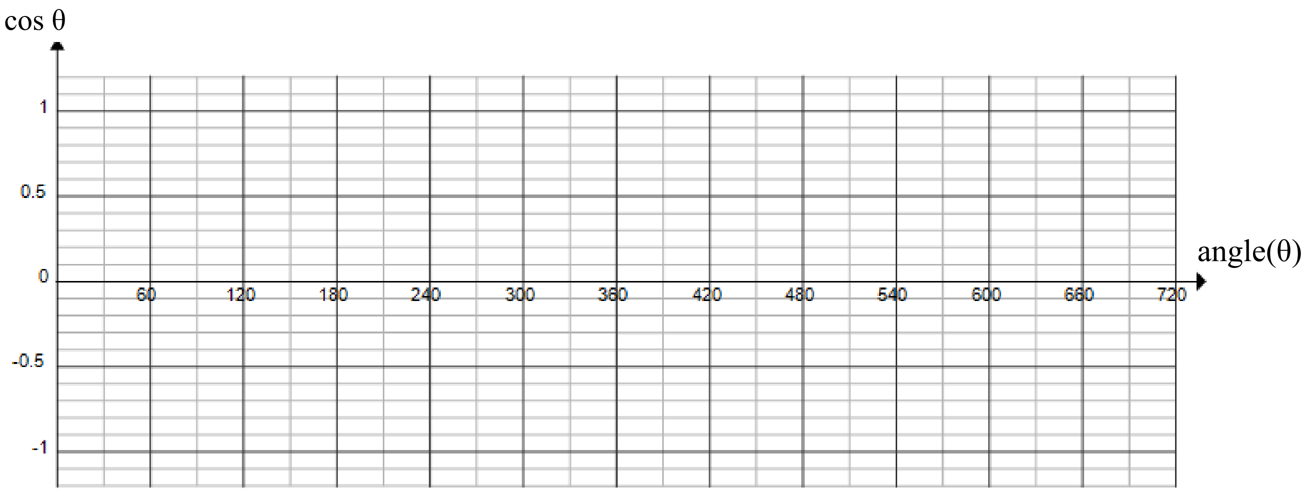
Cosine is distance from the ***y*-axis** on the Unit Circle.

1. Complete the table.

Angle θ (°)	0	30	60	90	120	150	180	210	240	270	300	330
Exact value of *y* (cosθ)												
Decimal value of *y* (2 decimal places)												

	360	390	420	450	480	510	540	570	600	630	660	690	720
Exact value of *y* (cosθ)													
Decimal value of *y* (2 decimal places)													

2. Use the decimal values of cosθ, and plot the ordered pairs (θ, cosθ) on the grid below. Join the points with a smooth continuous curve.



Today's Homework Practice includes:

Lesson 6.1: pp. 352-355 #1 – 8

Lesson 6.2: Complete the cosine funcon sketch.

Note how it is different than y=sinx

6.2 SineTracer.gsp