Last day's work: pp. 352-355 #1 – 8 7h 8g

Complete the cosine funcon sketch.

Note how it is different than y=sinx

Today's Learning Goal(s):

Date: _____

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

a) understand the properties and characteristics of sinusoidal functions.
b) relate the properties of sinusoidal functions to real world situations.

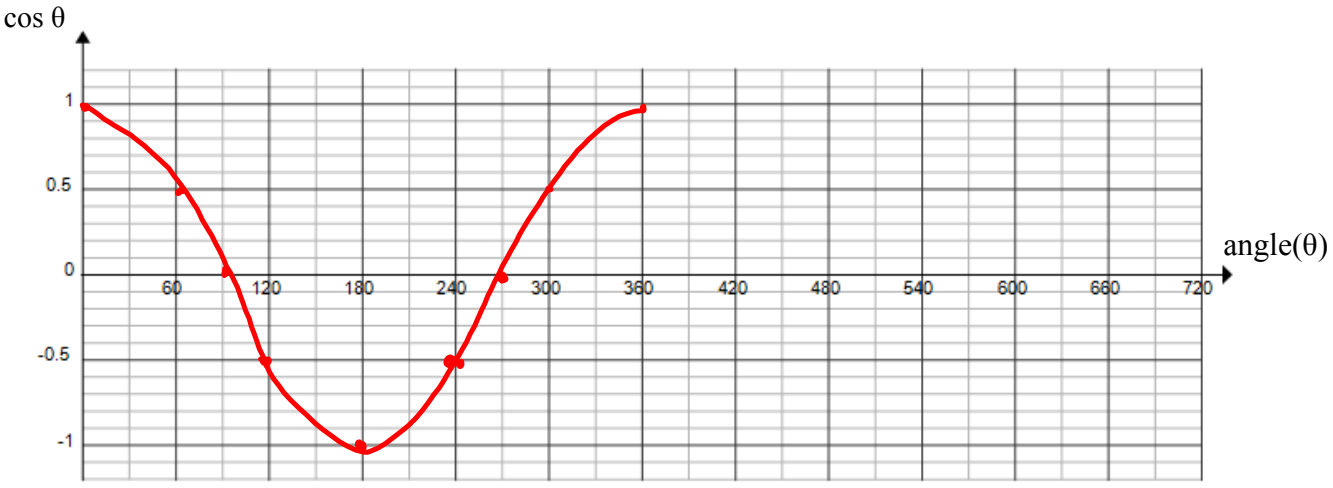
From yesterday

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

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.



Show Sine Tracer using Geometer's Sketchpad

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

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

6.2 Sinusoidal Functions and Their Properties

Date: May 16/17

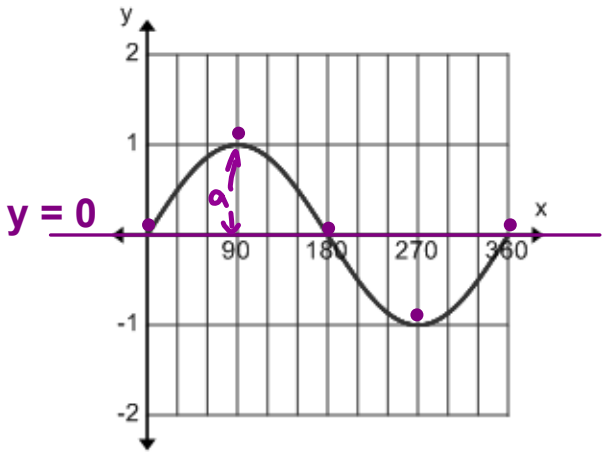
A sinusoidal function is a periodic function whose graph looks like smooth symmetrical waves. Any portion of the wave can be horizontally translated onto another portion of the curve.

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

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°, ...**

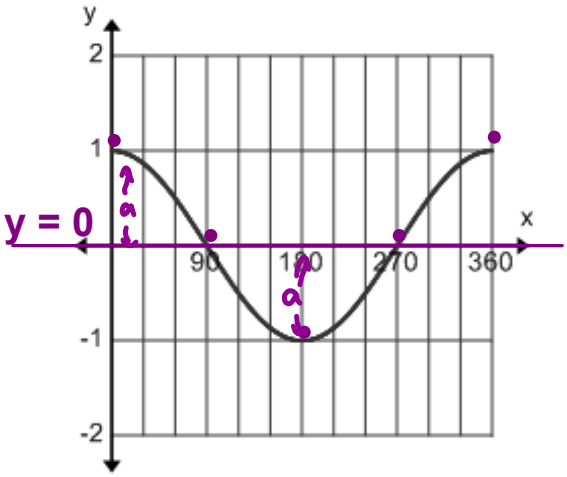


We will use "5 Key Points" to make our sketches.

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°, ...**



We will use "5 Key Points" to make our sketches.

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: $y = \frac{\text{max}+\text{min}}{2}$

$= \frac{6+(-2)}{2}$

$y = 2$

Amplitude = 4 $a = \frac{\text{max}-\text{min}}{2}$

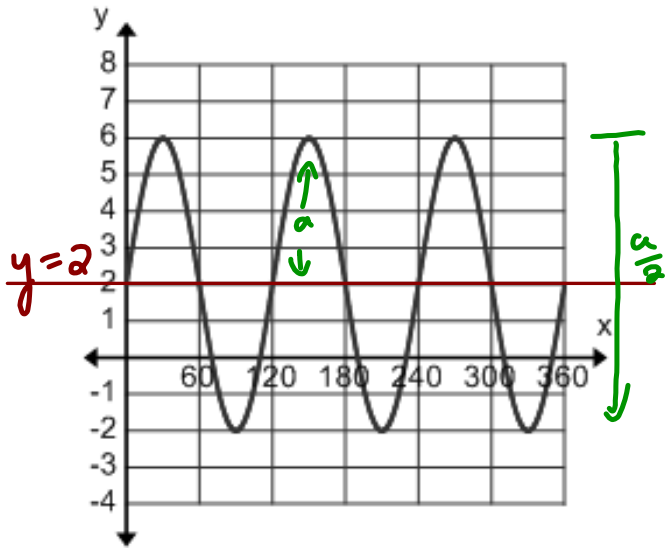
$= \frac{6-(-2)}{2}$

$= \frac{8}{2}$

$= 4$

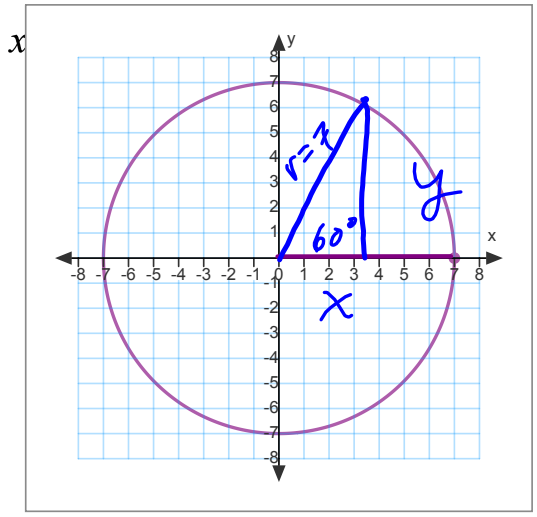
Domain = $\{x \in \mathbb{R}\}$

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



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

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

SYR

CXR

$7(\cos 60^\circ) = 7\left(\frac{x}{7}\right)$

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

$y = 7\sin 60^\circ$

$x = 7\cos 60^\circ$

$\therefore P(x, y) = (7\cos 60^\circ; 7\sin 60^\circ)$

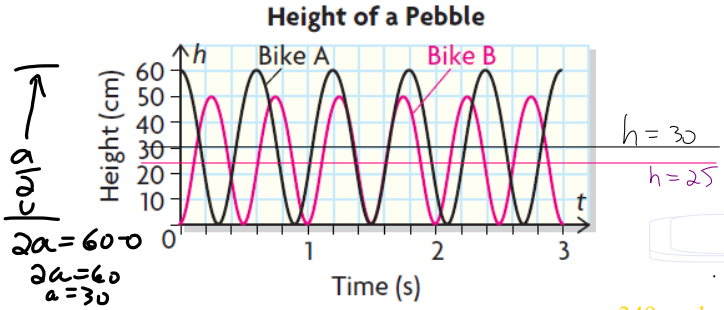
$\therefore P(x, y) = (r\cos\theta, r\sin\theta)$

6.3 Interpreting Sinusoidal Functions

Date: May 16/17

Ex. 1

Two students are riding their bikes. A pebble is stuck in the tire of each bike. The two graphs show the heights of the pebbles above the ground (in terms of time).



1. What information can we get from these graphs? p.349 peak vs. trough
2. How are the graphs the same/different?
   Are both wheels the same diameter?
   Bike A: diameter = 60 cm Bike B: diameter = 50 cm
3. Calculate and compare:

a) the amplitude Bike A: amplitude = 30 cm Bike B: amplitude = 25 cm

b) the period

Bike A: period = 0.6 sec
The pebble takes 0.6 s to complete 1 revolution.

Bike B: period = 0.5 sec
The pebble takes 0.5 s to complete 1 revolution.

Note: This is NOT the speed of the wheel!
We will compare speeds in part d)

c) the equation of the axis

Bike A: $\frac{60 + 0}{2} = 30$

The equation of the axis for Bike A is $h = 30$.

Bike A's wheel axle is 30 cm above the ground.

Bike B: $\frac{50 + 0}{2} = 25$

The equation of the axis for Bike B is $h = 25$.

Bike B's wheel axle is 25 cm above the ground.

d) the speed of each bike

Speed is equal to distance divided by time, so we first have to figure out how far each bike travels when the wheel completes one revolution. This distance is the circumference.

Circumference:

Bike A

$C_A = 2\pi r_A$

$C_A = 2\pi(30)$

$C_A = 60\pi$

$C_A \doteq 188.5$ cm

$C_A \doteq 1.885$ m

Speed:

$s_A = \frac{d}{t}$

$s_A = \frac{1.885}{0.6}$

$s_A \doteq 3.14$ m/s

Circumference:

Bike B

$C_B = 2\pi r_B$

$C_B = 2\pi(25)$

$C_B = 50\pi$

$C_B \doteq 157.1$ cm

$C_B \doteq 1.571$ m

Speed:

$s_B = \frac{d}{t}$

$s_B = \frac{1.571}{0.5}$

$s_B \doteq 3.14$ m/s

What does the amplitudes being different for these two graphs mean?
That the diameters for the two bike wheels are different

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

Last day's work: p. 3xx #1 – 7

Today's Homework Practice includes:

READ pp. 359-363 Ex.1 – "Need to Know"

(If time: ***Demo p.363 8a on TI-84*****)**

pp. 363-364 #1 – 4, 8, 9 [15,16]

pp. 370-372 #1 – 8, 13 [15]