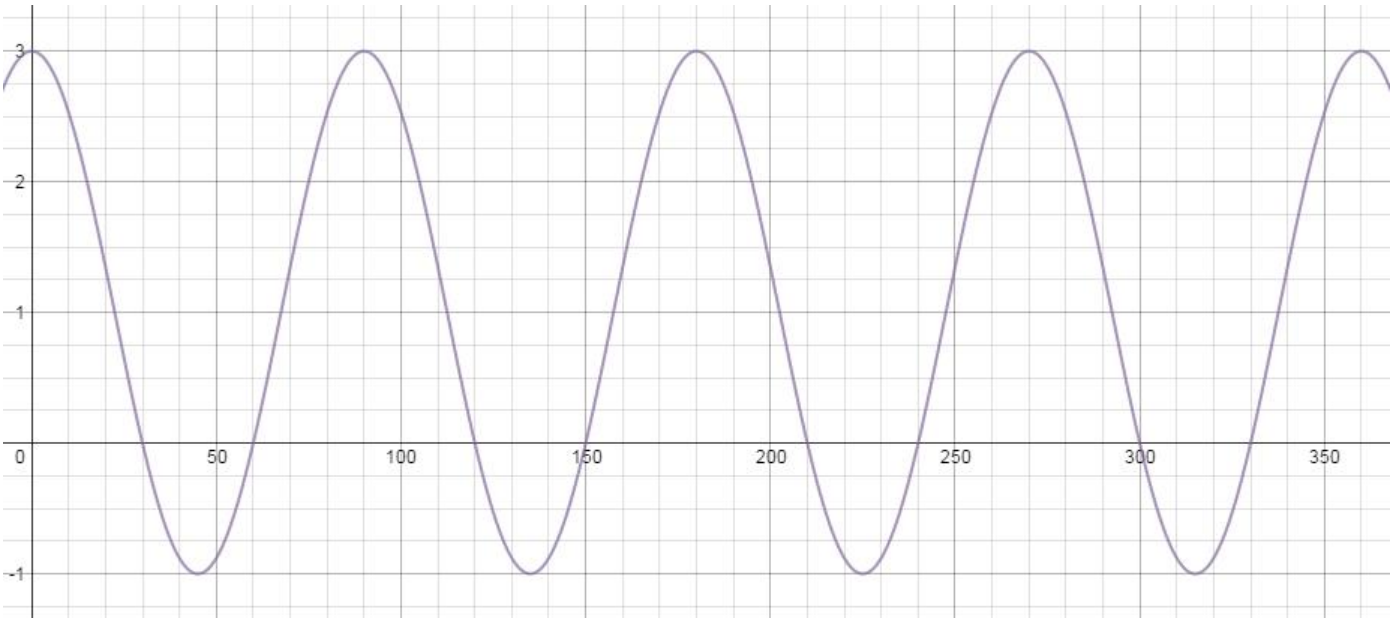
5.40 Modelling with Trig Equations

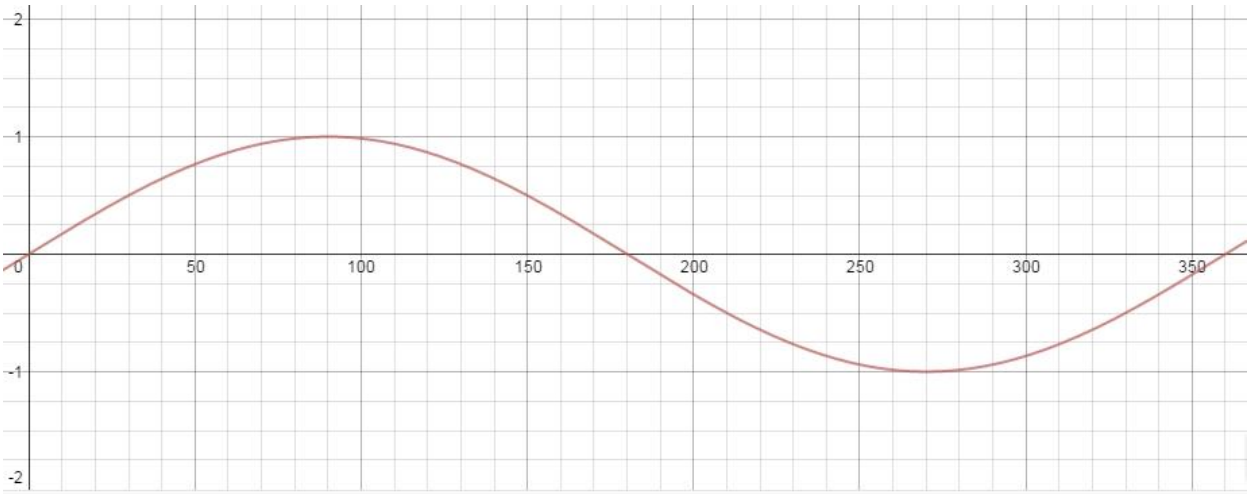
Warm Up:
State the transformation to: $f(x) = -2\sin(x - 60°) + 3$

Understanding how period, amplitude, max and min and the axis of curve relate to the equation



	y = cos(x)	y = 2cos(4x) + 1
Max value		
Min value		
Axis of Curve		
Amplitude		
Period		
# of cycles in 360		
“a”		
“k”		
“d”		
“c”		

Understanding the Sine Curve



Starts at:

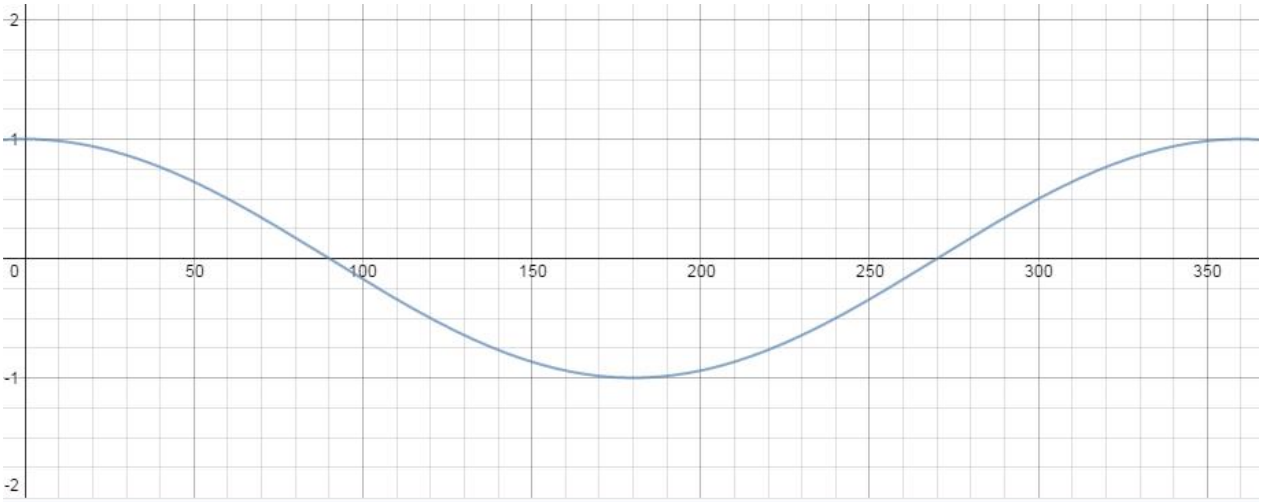
First Quarter:

Halfway:

Third Quarter:

Ends at:

Understanding the Cosine Curve



Starts at:

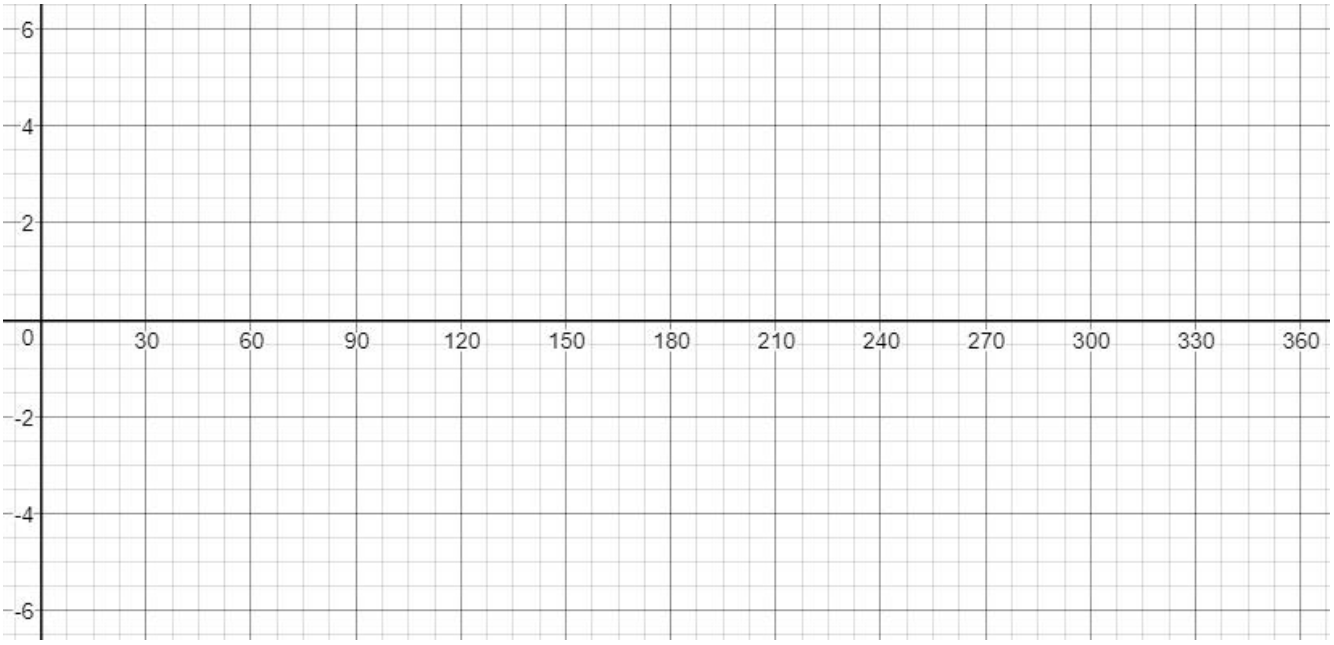
First Quarter:

Halfway:

Third Quarter:

Ends at:

Example:
A sinusoidal function has an amplitude of 2 units, a period of 180°, and a max at (0,3). Represent the function with two different equations.



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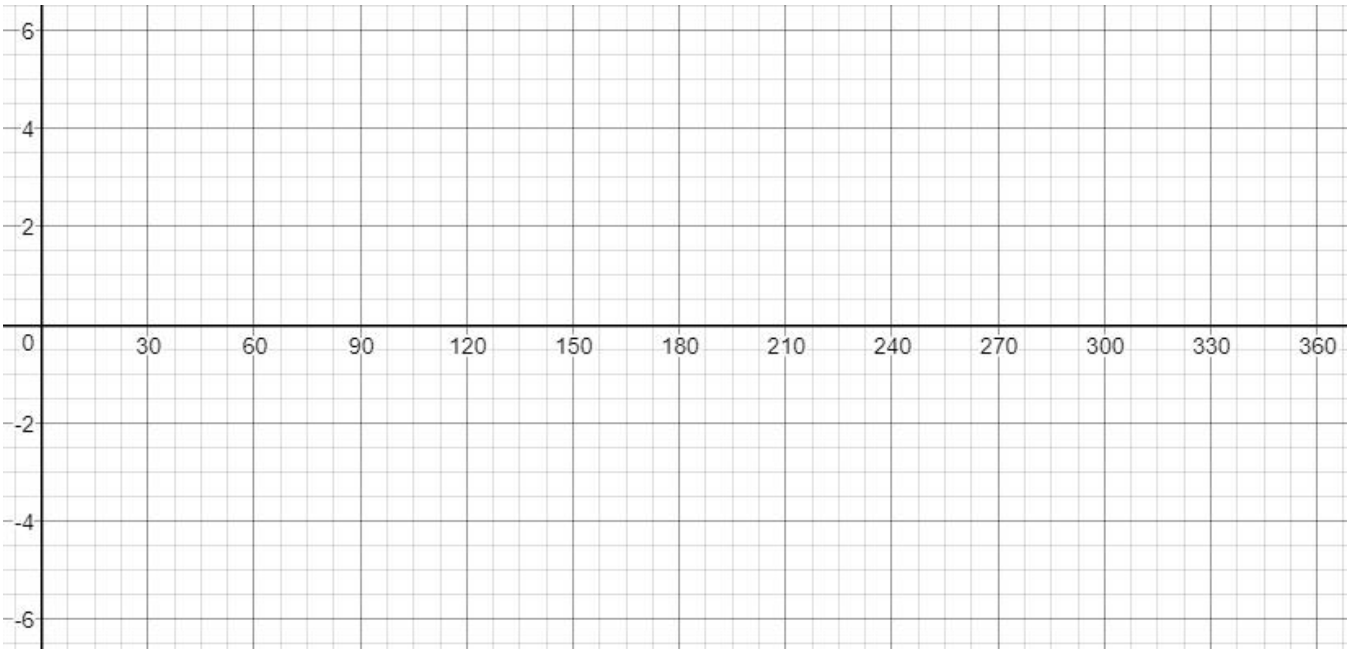

Determine the equation that models this data:

x	0	30	60	90	120	150	180
y	3	2	1	2	3	2	1

What is the max?
What is the min?
How long does it take for one cycle?
Where is the equation of the axis?
Do we start at the axis or at a max/min?

Determine the equation that models this data:

x	-180	0	180	360	540	720	900
y	17	13	17	21	17	13	17

What is the max?
What is the min?
How long does it take for one cycle?
Where is the equation of the axis?
Do we start at the axis or at a max/min?

Steps to follow when modeling:

1. Determine the max and min

2. Determine the axis of curve: $y = \frac{\max + \min}{2}$

3. Determine the amplitude: $\frac{\max - \min}{2}$

4. Determine how many cycles are in 360 to find k.

5. Decide which model
- Does the graph start at a max/min? --> cosine
- Does the graph start at the axis? --> sine
- Neither? --> Your choice - you have to determine the horizontal (phase) shift!

Example

A group of students are tracking their friend, Bunter, on a Ferris Wheel. They know that Bunter reaches the maximum height of 11 metres at 10 seconds then reaches the minimum height above the ground of 1 metre at 55 seconds. Find the equation to model Bunter's height above the ground as he travels on the Ferris Wheel.

Example

Smudger is floating on an inner tube in a wave pool. He is 1.5 metres from the bottom of the pool when he is at the trough of the wave. A stop watch starts timing at this point. In 1.25 seconds, he is on the peak of the wave, 2.1 metres from the bottom of the pool.

a) Determine the equation of the function that expresses Smudger's distance from the bottom of the pool in terms of time.

b) How far above the bottom of the pool is Smudger after 4 seconds?

c) If data was collected for a total of 40 seconds, how many complete cycles would have occurred?

d) If the period of the function changes to 3 seconds, what is the equation of the new function?

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