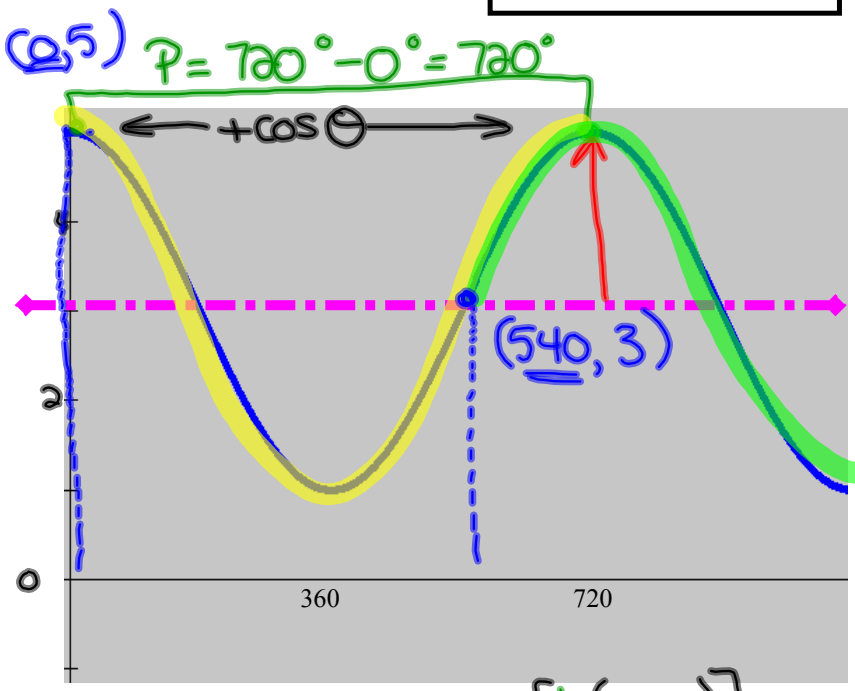
# Warm-up




## Find:

Local Max: 5

Local Min: 1

Equation of Sinusiodal Axis: $\frac{min+max}{2} = \frac{1+5}{2} = 3$ ; $\boxed{y=3}$

Period: 720°

Amplitude: 2

Horizontal Translation (C): 0

Vertical Translation (D): 3

$B = \frac{360}{P} = \frac{360}{720} = \frac{1}{2}$

Equation of Graph: $y = 2\cos\left[\frac{1}{2}(x-0)\right]+3$

$y = 2\cos\frac{1}{2}(x)+3$

or $y = 2\sin\left[\frac{1}{2}(x-540°)\right]+3$

# Questions from Homework

h) $\frac{1}{2}(y+2) = 3\cos(x-90^\circ)$

$y+2 = 6\cos(x-90^\circ)$

$y = 6\cos(x-90^\circ)-2$

$A=6$ $B=1$ $C=90^\circ$ $D=-2$

$P=\frac{360^\circ}{1}=360^\circ$

Sinusoidal Axis: $y=-2$

# Equations in Standard Form

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

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

$B = \frac{360}{P}$ → 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

In which direction would these graphs be shifted?

$y = \sin(x) + 2$

C=0 D=2

Up

$y = \sin(x - 30^\circ)$

C=30° D=0

Right

$y = -\cos(x) - 3$

C=0 D=-3

Down

$y = \cos(x + 90^\circ)$

C=-90° D=0

Left

## Sketching Sinusoidal Functions using Mapping

Development of a standard form for sinusoidal functions...

Standard Form $\longrightarrow$ $y = A\sin[B(x - C)] + D$

1. Reflection: If A < 0 the graph will be reflected in the $x$-axis.

2. Amplitude: The amplitude of the graph will be equal to | A | .

3. Period: The period of the graph will be equal to $\frac{360°}{B}$

4. Horizontal Phase Shift: The graph will shift "C" units to the left/right

5. Vertical Translation: The graph will shift "D" units up/down.

Mapping Notation: $(x, y) \rightarrow \left(\frac{x}{B} + C, Ay + D\right)$

# Using Mapping to Graph!

$f(\theta) = -2\sin[3(\theta + 30°)] - 2$ $\qquad (x, y) \rightarrow \left(\frac{x}{B} + C, Ay + D\right)$

$y = -2\sin[3(x+30°)] - 2$

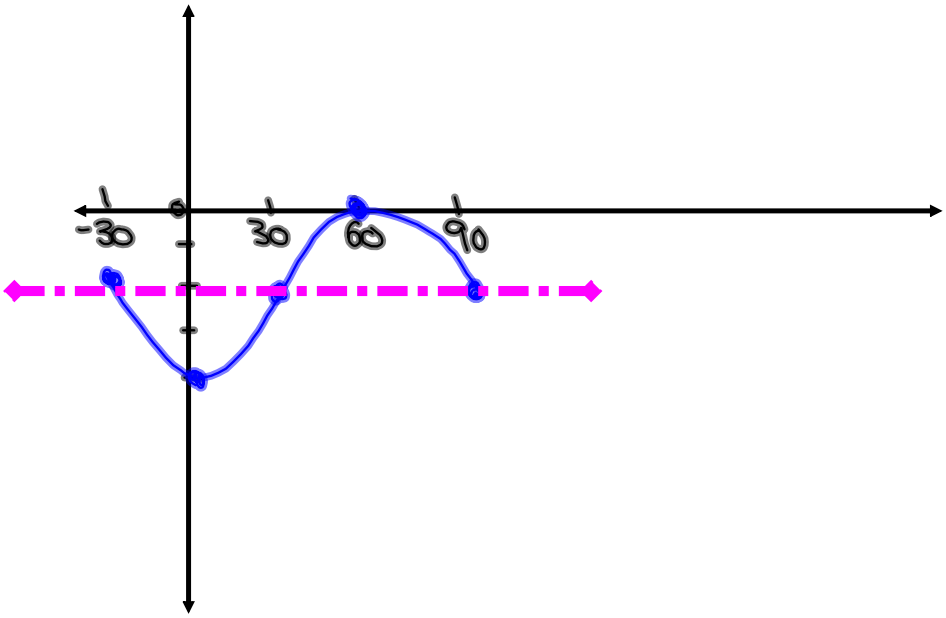
A = 2 $\qquad$ B = 3 $\qquad$ C = -30° $\qquad$ D = -2 $\qquad$ P = 120°

$y = -\sin x$

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

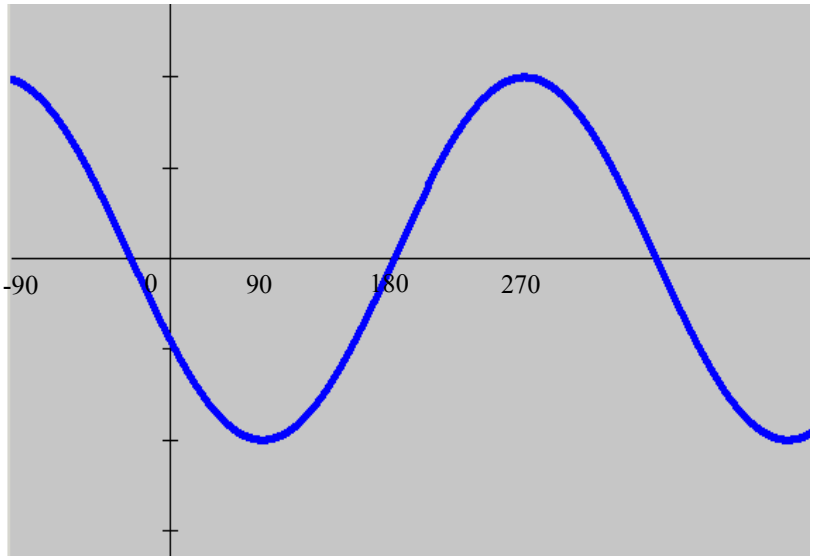
New points after mapping →

| x | y |
|---|---|
| -30° | -2 |
| 0° | -4 |
| 30° | -2 |
| 60° | 0 |
| 90° | -2 |



# Homework

What does Horizontal Translation look like?




Find:

Local Max: _____

Local Min: _____

Equation of Sinusiodal Axis:

_____

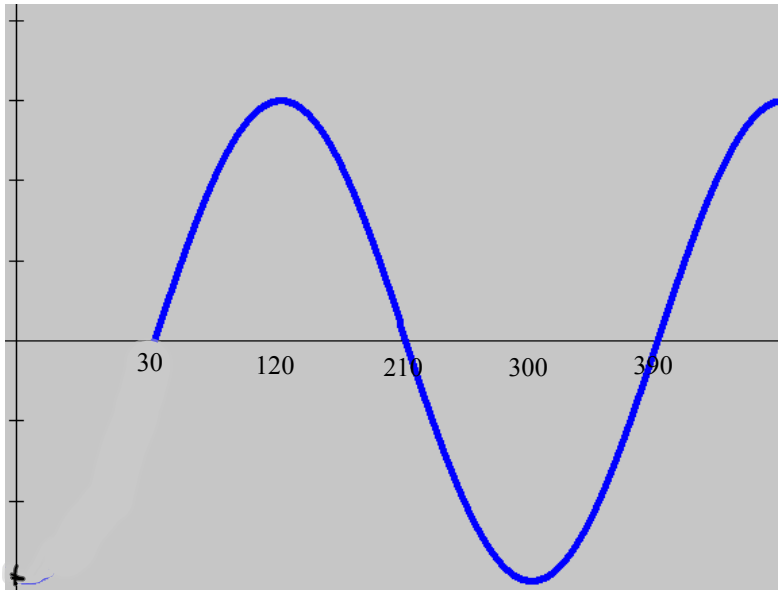
Period: _____

Amplitude: _____

Horizontal Translation (C): ____

Vertical Translation (D): _____

Equation of Graph: _____




Find:

Local Max: _____

Local Min: _____

Equation of Sinusiodal Axis:

_____

Period: _____

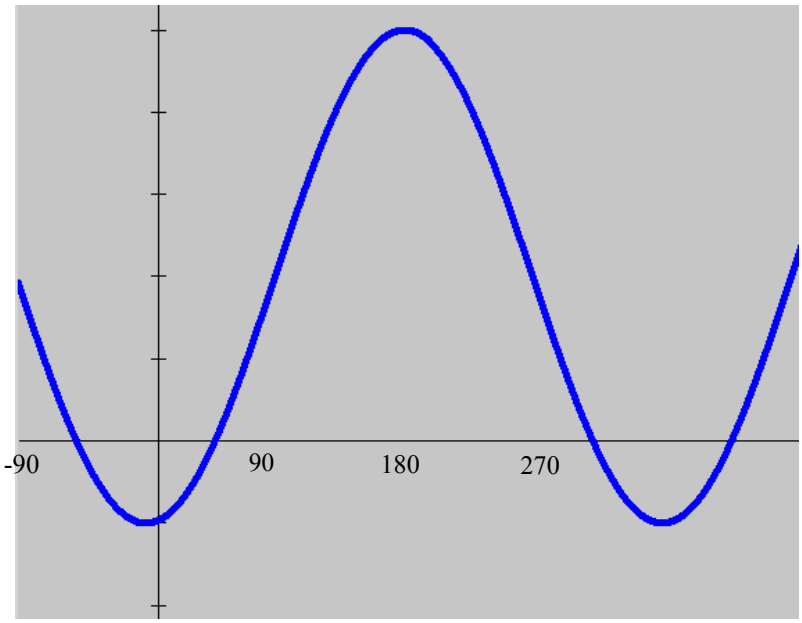
Amplitude: _____

Horizontal Translation (C): ____

Vertical Translation (D): _____

Equation of Graph: _____

# A little "C" and "D"




## Find:

Local Max: _____

Local Min: _____

Equation of Sinusiodal Axis:

_____

Period: _____

Amplitude: _____

Horizontal Translation (C): ____

Vertical Translation (D): _____

Equation of Graph: _____