Before we begin, are there any questions from last day's work? 4.3.3

Today's Learning Goal(s):

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

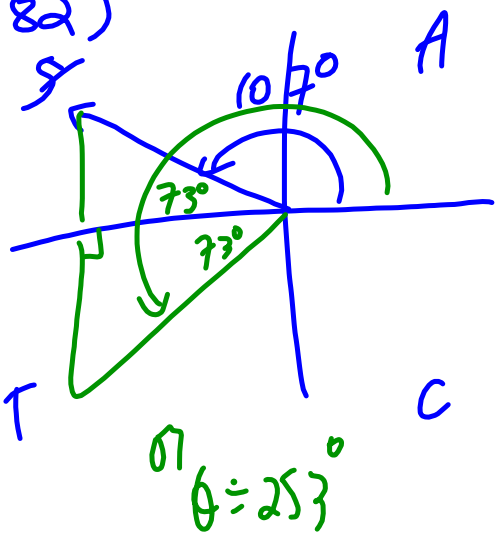
a) state the key properties of the sine and cosine functions.
b) perform horizontal and vertical translations to the sine and cosine functions.

9d) $\cos\theta = -0.2882$

$\theta = \cos^{-1}(-0.2882)$

$\doteq 106.75$

$\doteq 107^\circ$

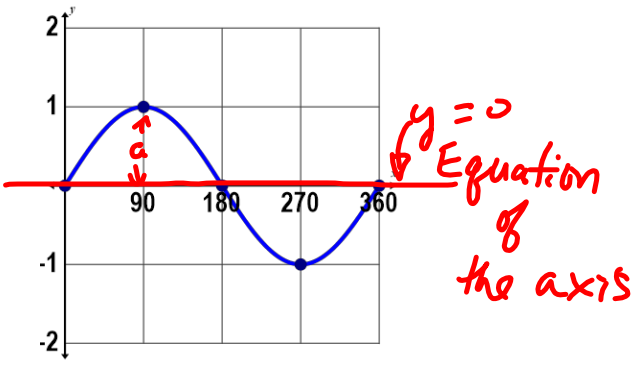


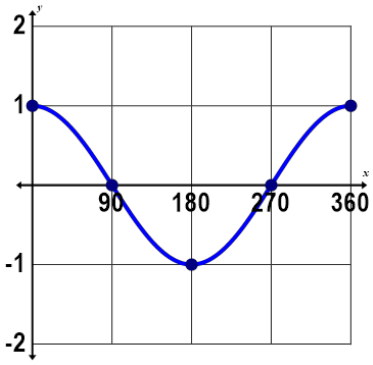
4.4.1 The Sine and Cosine Functions: Key Properties

Date: Apr. 11/16

Last day we created the graphs of:

a) $y = \sin x$ and b) $y = \cos x$





Key Properties

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

Maximum Value: 1

Minimum Value: -1

Range: $\{y \in R / -1 \leq y \leq 1\}$

Intercepts: 0, 180°, 360°

Amplitude: 1

Period: 360°

Increasing Interval: $0° \leq x \leq 90°, 270° \leq x \leq 360°$

Decreasing Interval: $90° \leq x \leq 270°$

Key Properties

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

Maximum Value: 1

Minimum Value: -1

Range: $\{y \in R / -1 \leq y \leq 1\}$

Intercepts: 90°, 270°

Amplitude: 1

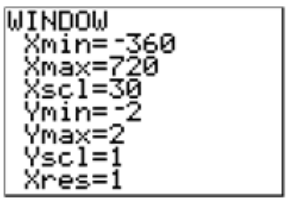
Period: 360°

Increasing Interval: $180° \leq x \leq 360°$

Decreasing Interval: $0 \leq x \leq 180°$

4.4.2 Investigating Horizontal and Vertical Translations

Using the TI-84, press the MODE button and set the third line to DEGREE, then set the WINDOW

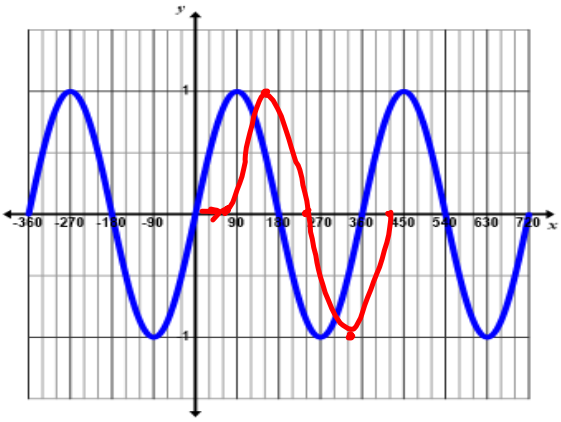


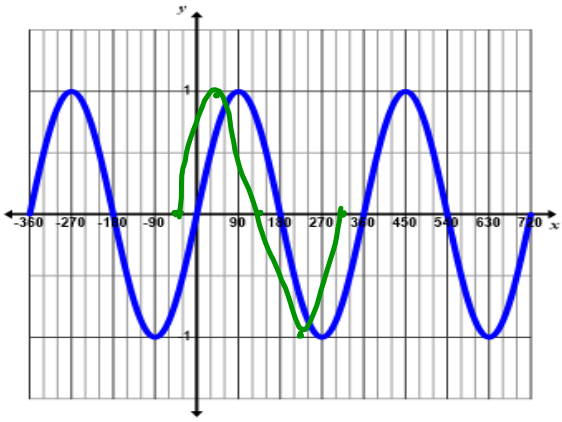
A. Comparing $y = \sin(x - d)$ to $y = \sin x$

1. On the calculator, enter $y_1 = \sin x$, then :

   a) $y_2 = \sin(x - 60°)$. Describe the transformation relative to $y = \sin x$. translated 60^o to the right

   b) Sketch y_2 on the grid on the top left of the next page.





   c) Turn off y_2. Enter $y_3 = \sin(x + 45°)$, then sketch it on the grid (above right).
   Describe this transformation relative to $y = \sin x$.

translated 45^o to the left

   d) Experiment with different values of d.
   Try $y = \sin(x - 25°)$, $y = \sin(x + 70°)$, etc.

If time permits, repeat the above, but replace all sin with cos. All else is the sa

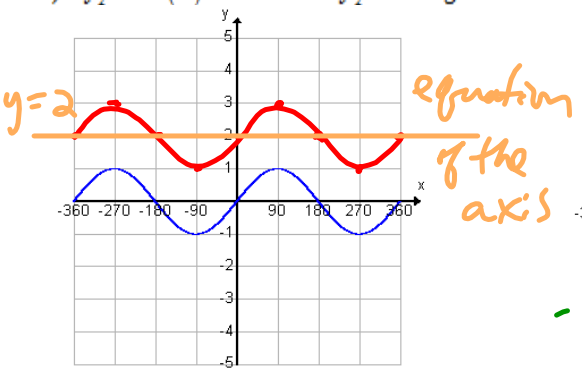
B. Comparing $y = \sin x + c$ to $y = \sin x$

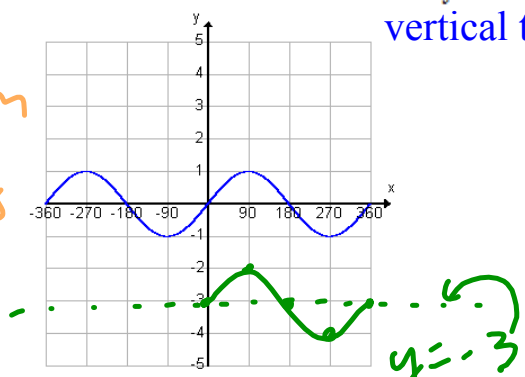
Modify the WINDOW settings:

```
WINDOW
 Xmin=-360
 Xmax=360
 Xscl=90
 Ymin=-5
 Ymax=5
 Yscl=1
 Xres=1
```

1. On the calculator, enter $y_1 = \sin x$, then :

a) $y_2 = \sin(x) + 2$. Sketch y_2 on the grid below. Describe the transformation relative to $y = \sin x$.





vertical translation up 2

b) Turn off y_2. Enter $y_3 = \sin(x) - 3$, then sketch it on the grid (above right).

Describe this transformation relative to $y = \sin x$.

vertical translation down 3

c) Experiment with different values of c.

Try $y = \sin(x) - 1$, $y = \sin(x) + 2.5$, etc.

If time permits, repeat the above, but replace all sin with cos. All else is the same

Summary

The graph of the function $y = \sin(x - d) + c$ is congruent to the graph of $y = \sin x$.

The differences are only in the placement of the graph.

Move the graph of $y = \sin x$:

$d°$ to the left when $d < 0$. [←] $d°$ to the right when $d > 0$. [→]

c units up when $c > 0$. [↑]

c units down when $c < 0$. [↓]

A vertical translation affects the range of the function,
but has no effect on the period, amplitude, or domain.

A horizontal translation slides a graph to the left or right,
but has no effect on the period, amplitude, domain, or range.