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

8c
9d
11e

Today's Learning Goal(s):

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

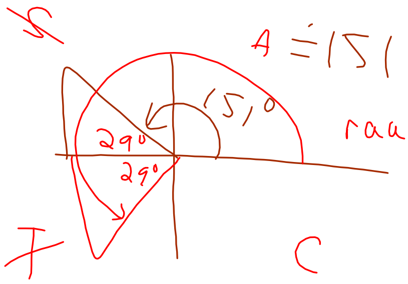
a) state the key properties of the sine and cosine functions.
b) perform horizontal and vertical translations to the sine and cosine functions.

8c) $\cos\theta = -0.8722$

$\theta = \cos^{-1}(-0.8722)$

$\theta \doteq 150.7$

$A \doteq 151^\circ$ or $\theta = 209^\circ$



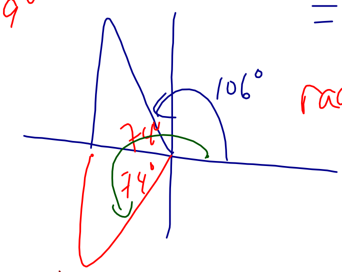
raa = 29°

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

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

$\doteq 106.3$

$\doteq 106$



raa = 74°

or $\theta \doteq 180^\circ + 74^\circ$

$\doteq 254^\circ$

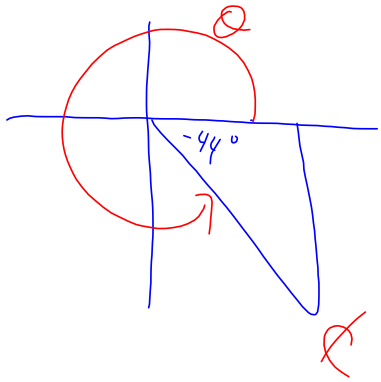
11e) $270^\circ \le \theta \le 360^\circ$

$\sin\theta = -0.69$

$\theta = \sin^{-1}(-0.69)$

$\doteq -43.6$

$\doteq -44$ $\therefore \theta = 316^\circ$



12e) $\cos\theta = 0.73$

$\theta = \cos^{-1}(0.73)$

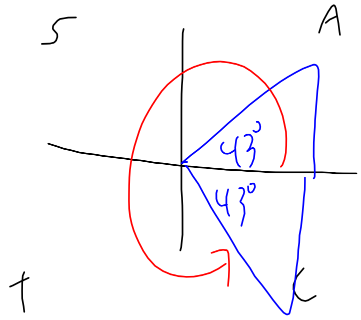
$\doteq 43.1$

$\doteq 43^\circ$ raa = 43°

$\therefore \theta \doteq 43^\circ$

or

$\theta \doteq 317^\circ$

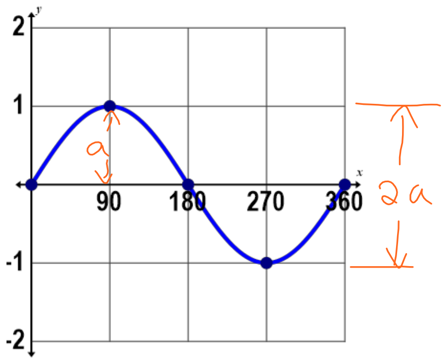


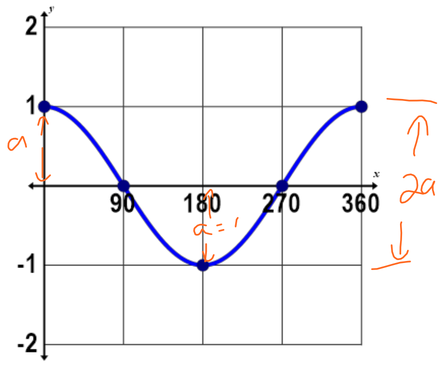
4.4.1 The Sine and Cosine Functions: Key Properties

Date: Oct. 29/19

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: $\{y \in \mathbb{R} \mid -1 \le y \le 1\}$

Intercepts: $0°, 180°, 360°$

Amplitude: 1

Period: $360°$

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

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

Key Properties

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

Maximum Value: 1

Minimum Value: -1

Range: $\{y \in \mathbb{R} \mid -1 \le y \le 1\}$

Intercepts: $90°, 270°$

Amplitude: 1

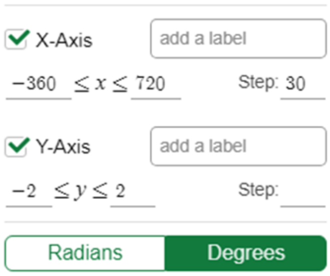
Period: $360°$

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

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

4.4.2 Investigating Horizontal and Vertical Translations

Using desmos, change your window settings to:



(Be certain to change to Degrees)

(You don't need to type the degree symbol in Desmos.)

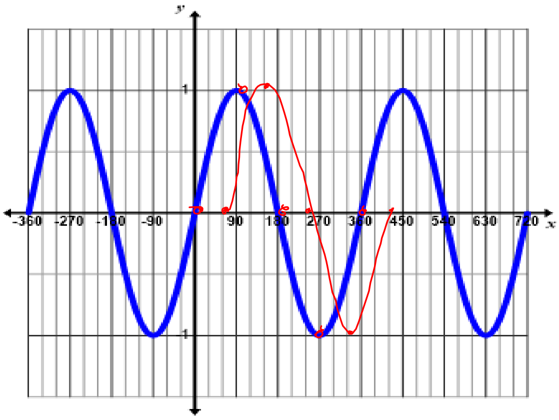
A. Comparing $y = \sin(x - d)$ to $y = \sin x$

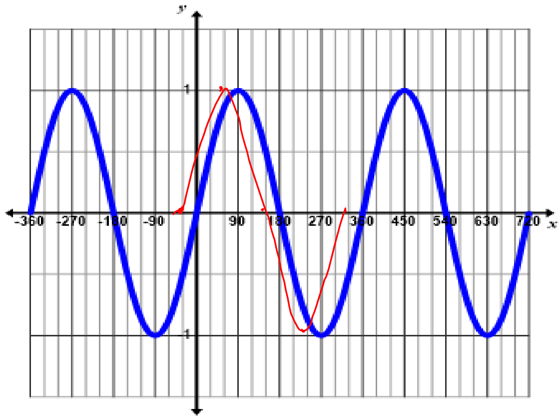
1. Enter $y = \sin x$, then:

   a) Enter $y = \sin(x - 60°)$. Describe the transformation relative to $y = \sin x$.

   translated 60^o to the right

   b) Sketch $y = \sin(x - 60°)$ on the grid on the top left of the next page.





   c) Turn off $y = \sin(x - 60°)$. Enter $y = \sin(x + 45°)$, then sketch it on the grid (above right). Describe this transformation relative to $y = \sin x$.

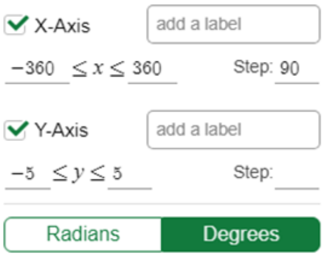
   translated 45^o to the left

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

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

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

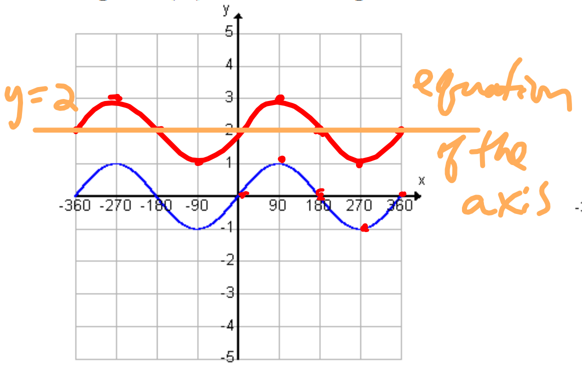
Modify the WINDOW settings:

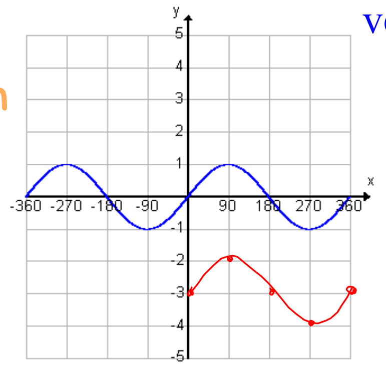


1. On the calculator, enter $y_1 = \sin x$, then :

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 $d > 0$. [→]

ex $d = -30°$

$x - (-30°) = (x + 30°)$

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.