

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

Today's Learning Goal(s):

8b, 13d

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

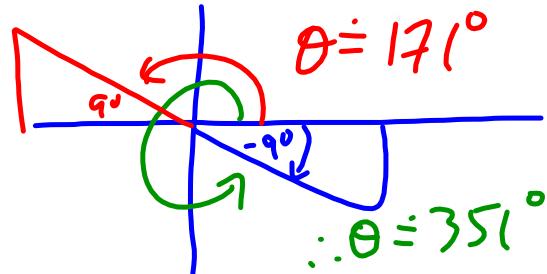
- state the key properties of the sine and cosine functions.
- perform horizontal and vertical translations of the sine and cosine functions.

Return Unit 3 Summative?

8. Use each trigonometric ratio to determine all values of θ , to the nearest degree if $0^\circ \leq \theta \leq 360^\circ$.

b) $\tan \theta = -0.1623$

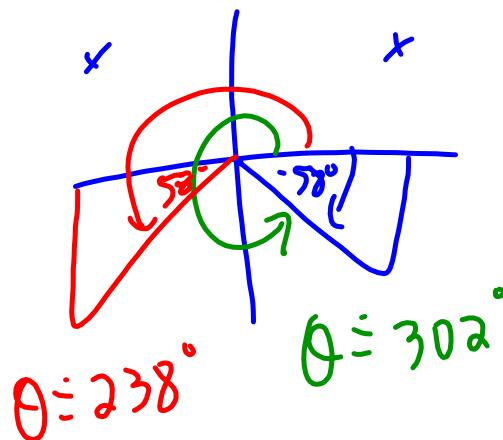
$$\begin{aligned}\theta &= \tan^{-1}(-0.1623) \\ &\approx -9.2^\circ \\ &= -9^\circ\end{aligned}$$



13. Determine two angles between 0° and 360° that have each trigonometric function value. Write the angles to the nearest degree.

d) $\sin \theta = -0.85$

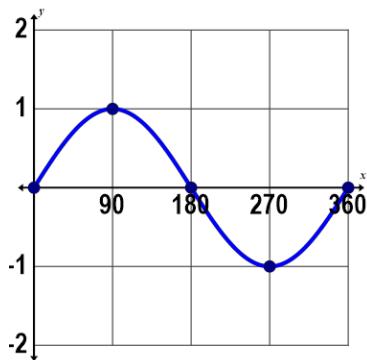
$$\begin{aligned}\theta &= \sin^{-1}(-0.85) \\ &\approx -58.2^\circ \\ &= -58^\circ\end{aligned}$$



4.4.1 The Sine and Cosine Functions: Key Properties

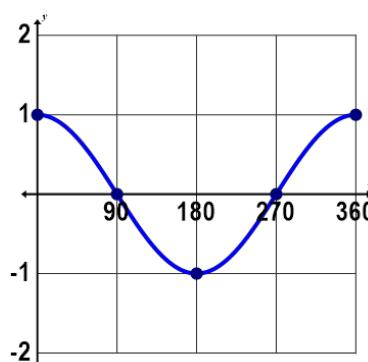
Last day we created the graphs of:

a) $y = \sin x$



and

b) $y = \cos x$



Date: Apr. 9/18

Key Properties

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

Maximum Value: 1

Minimum Value: -1

Range: $\Sigma y \in \mathbb{R} | -1 \leq y \leq 1 \}$

Intercepts: 0, 180, 360

Amplitude: 1

Period: 360°

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

Decreasing Interval: $90^\circ \leq x \leq 270^\circ$

Key Properties

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

Maximum Value: 1

Minimum Value: -1

Range: $\Sigma y \in \mathbb{R} | -1 \leq y \leq 1 \}$

Intercepts: 90, 180, 270, 360

Amplitude: 1

Period: 360°

Increasing Interval: $180^\circ \leq x \leq 360^\circ$

Decreasing Interval: $0^\circ \leq x \leq 180^\circ$

4.4.2 Investigating Horizontal and Vertical Translations

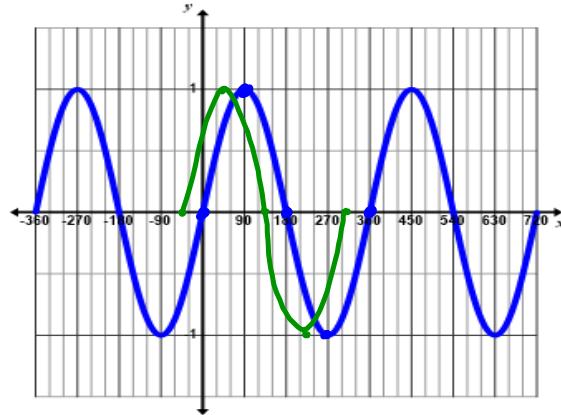
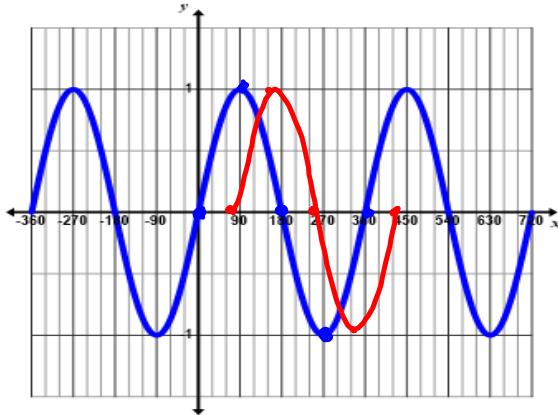
Using the TI-84, press the MODE button and set the third line to DEGREE, then set the WINDOW

NORMAL SCI ENG	WINDOW
FLOAT 0 1 2 3 4 5 6 7 8 9	Xmin=-360
RADIAN DEGREE	Xmax=720
FUNC PAR PDQ SEQ	Xscl=30
CONNECTED DOT	Ymin=-2
SEQUENTIAL SIMUL	Ymax=2
REAL a+bi re^θi	Yscl=1
FULL HORIZ G-T	Xres=1
SET CLOCK 03/05/09 8:20PM	

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

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

- $y_2 = \sin(x - 60^\circ)$. Describe the transformation relative to $y = \sin x$.  translated 60° to the right
- Sketch y_2 on the grid on the top left of the next page.



- c) Turn off y_2 . Enter $y_3 = \sin(x + 45^\circ)$, then sketch it on the grid (above right).

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

 translated 45° to the left

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

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

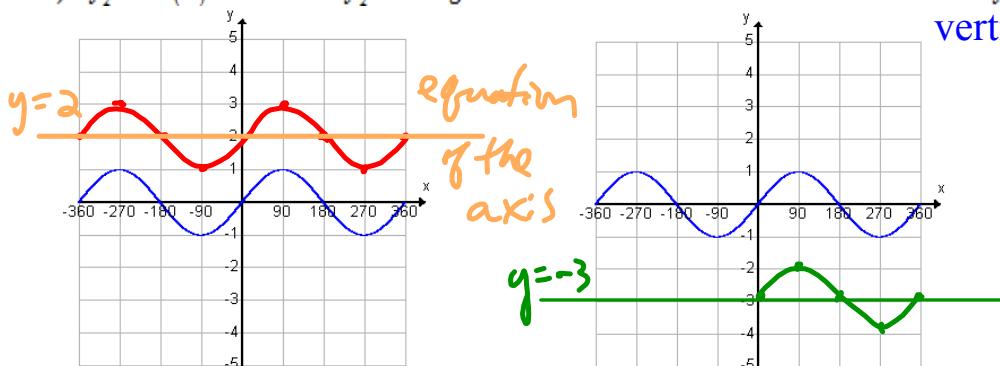
- B. Comparing $y = \sin x + c$ to $y = \sin x$

Modify the WINDOW settings:

```
WINDOW
Xmin=-360
Xmax=360
Xsc1=90
Ymin=-5
Ymax=5
Ysc1=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 $d < 0$. [\leftarrow]

d° to the right when $d > 0$. [\rightarrow]

c units up when $c > 0$. [\uparrow]
 c units down when $c < 0$. [\downarrow]

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.

$$\begin{aligned} \text{if } d = -30^\circ \\ y = \sin(x - (-30^\circ)) \\ y = \sin(x + 30^\circ) \end{aligned}$$

$$\begin{aligned} \text{if } d = 45^\circ \\ y = \sin(x - 45^\circ) \end{aligned}$$