

Today's Plan:

Learning Target (standard): I will describe properties of the trigonometric parent functions. I will write trigonometric functions using transformations.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Graph using transformations.

$$f(x) = -3\sqrt{\frac{1}{2}x + 2} - 3$$

Parent: $f(x) = \sqrt{x}$

1) $f(x) = -\sqrt{x}$ r_x

2) $f(x) = -3\sqrt{x}$ v.s. by 3

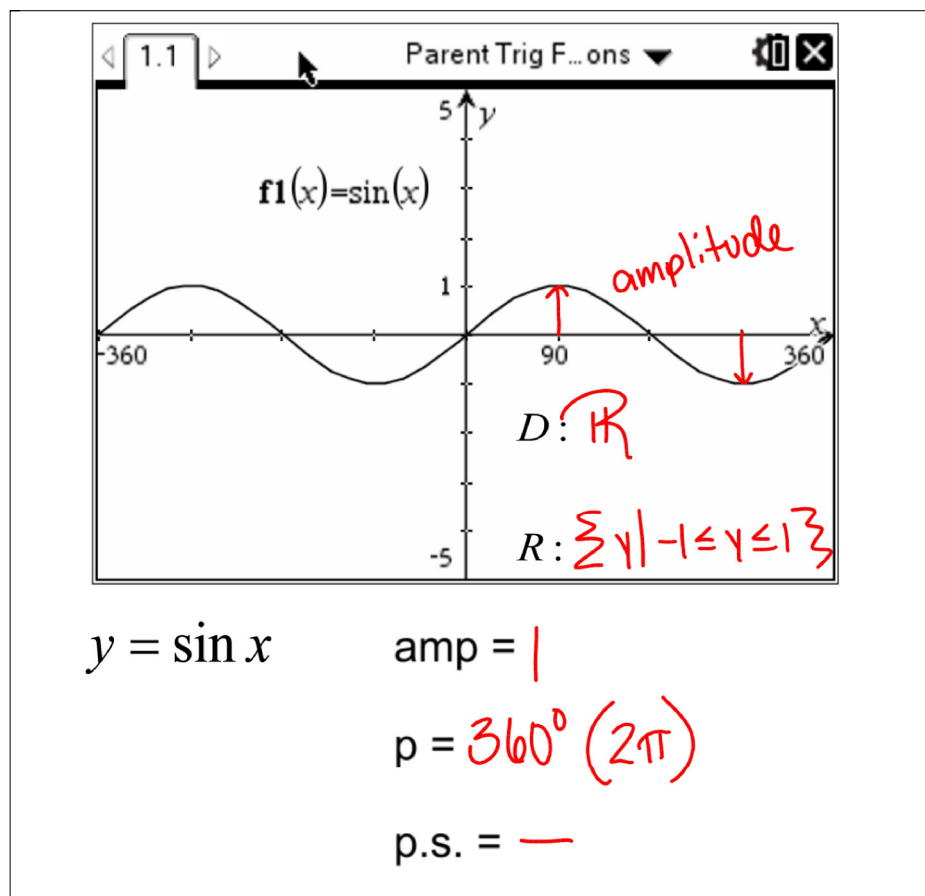
3) $f(x) = -3\sqrt{\frac{1}{2}x}$ h.s. by 2

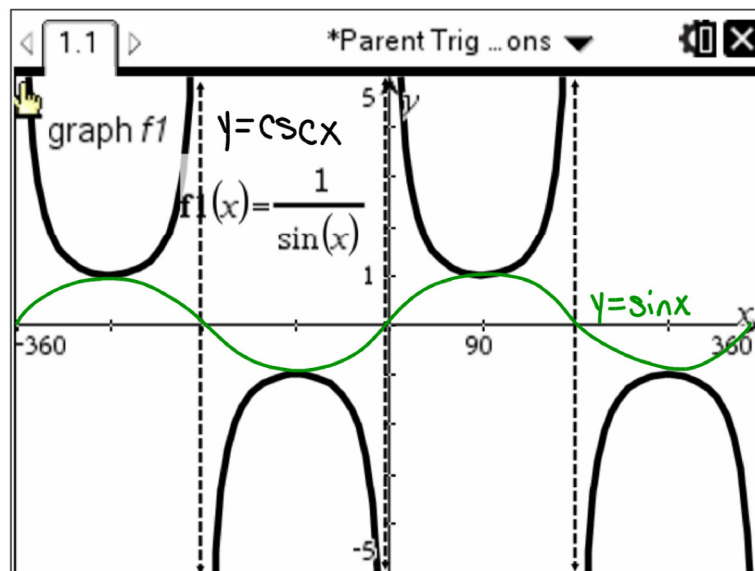
4) $f(x) = -3\sqrt{\frac{1}{2}(x+4)}$ shift left 4

5) $f(x) = -3\sqrt{\frac{1}{2}x + 2} - 3$ shift down 3

Properties of Parent Functions:

- amplitude - the "height" of a wave
- period- the length of time required to complete one cycle
- phase shift - shift left or right

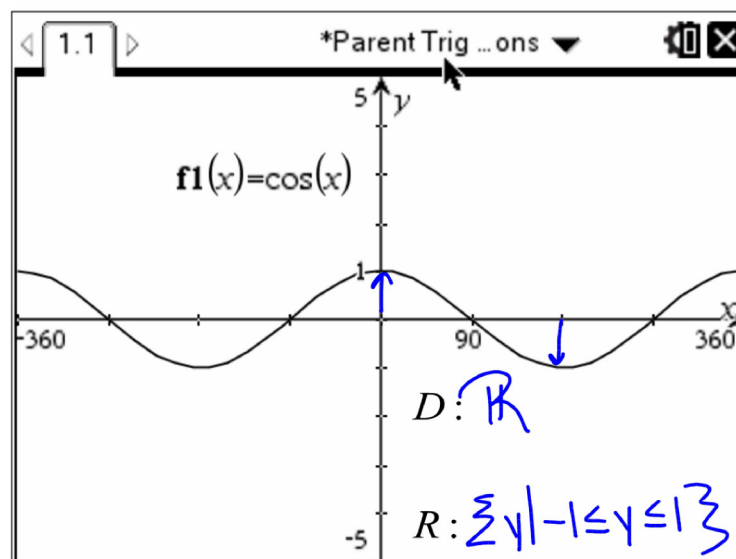




$$y = \csc x \quad \text{amp} = \text{---} \quad D: \{x \mid x \neq \text{coterminal to } 0^\circ \text{ \& } 180^\circ\}$$

$$p = 360^\circ (2\pi) \quad R: \{y \mid y \leq -1, y \geq 1\}$$

$$p.s. = \text{---}$$



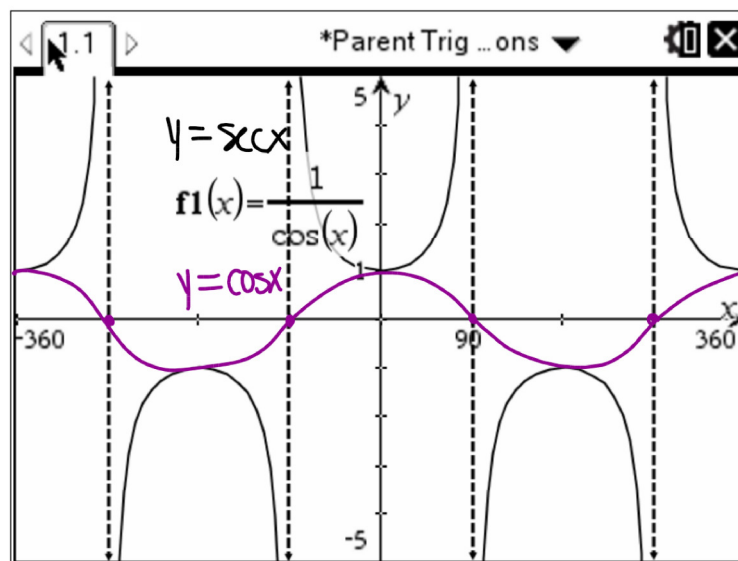
$$y = \cos x \quad \text{amp} = 1$$

$$p = 360^\circ (2\pi)$$

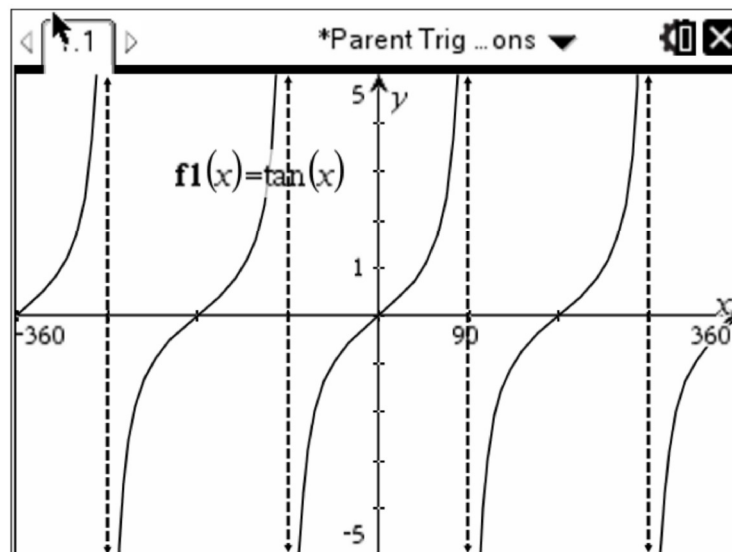
$$p.s. = \text{---}$$

$$D: \mathbb{R}$$

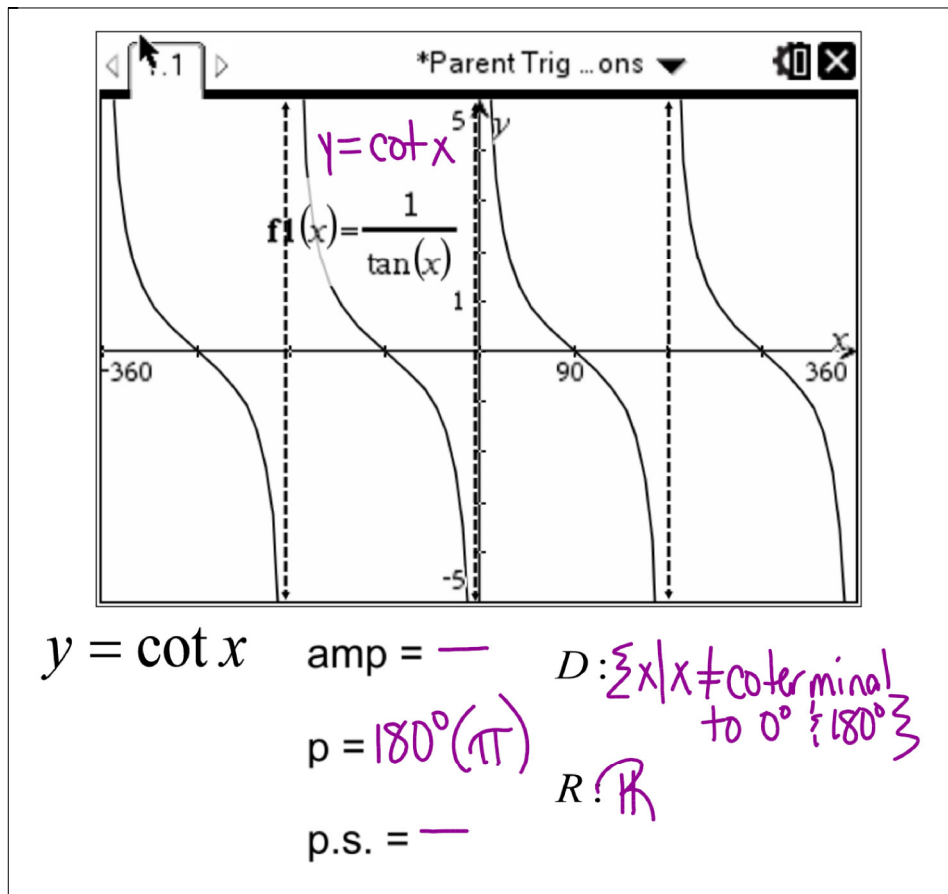
$$R: \{y \mid -1 \leq y \leq 1\}$$



$y = \sec x$ amp = — $D: \{x \mid x \neq \text{coterminal to } 90^\circ \text{ or } 270^\circ\}$
 $p = 360^\circ (2\pi)$ $R: \{y \mid y \leq -1, y \geq 1\}$
 $p.s. = \text{—}$



$y = \tan x$ amp = — $D: \{x \mid x \neq \text{coterminal to } 90^\circ \text{ or } 270^\circ\}$
 $p = 180^\circ (\pi)$ $R: \mathbb{R}$
 $p.s. = \text{—}$



Transformations:

* true for all trig parent functions

- 1) reflection over x -axis

$$y = -\sin x$$

- 2) reflection over y -axis

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

- 3) vertical stretch/compression

$$y = c \tan x$$

"amplitude"

$c > 1$ v.s. by c

$0 < c < 1$ v.c. by c

- 4) horizontal stretch/compression

$$y = \csc(cx)$$

"period"

$0 < c < 1$ h.s. by $\frac{1}{c}$

$c > 1$ h.c. by $\frac{1}{c}$

- 5) shift left/right

$$y = \sec(x+c), y = \sec(x-c)$$

"phase shift"

- 6) shift up/down

$$y = c + \cot x$$

$$y = -c + \cot x$$

$$y = \cot x + c$$

$$y = \cot x - c$$

Write the transformations.

$$y = -2\sin(3x - \pi)$$

parent: $y = \sin x$ amp = 1
 $\varphi = 2\pi$
 $\varphi.s. = -$

1) $y = -\sin x$ r_x

2) $y = -2\sin x$ amp = 2

3) $y = -2\sin(3x)$ h.c. by $\frac{1}{3}$ $\varphi = \frac{2\pi}{3}$

4) $y = -2\sin(3(x - \frac{\pi}{3}))$ shift right $\frac{\pi}{3}$ $\varphi.s. = \frac{\pi}{3}$

Write the transformations.

$$y = \frac{2}{3}\cos\left(-\frac{1}{2}x - \frac{\pi}{4}\right)$$

parent: $y = \cos x$ amp = 1
 $\varphi = 2\pi$
 $\varphi.s. = -$

1) $y = \cos(-x)$ r_y

2) $y = \frac{2}{3}\cos(-x)$ v.c. by $\frac{2}{3}$ amp = $\frac{2}{3}$

3) $y = \frac{2}{3}\cos(-\frac{1}{2}x)$ h.s. by 2 $\varphi = 4\pi$

4) $y = \frac{2}{3}\cos(-\frac{1}{2}(x + \frac{\pi}{2}))$ shift left $\frac{\pi}{4}$ $\varphi.s. = -\frac{\pi}{4}$

Write the transformations.

$$f(x) = -2 \tan\left(\frac{1}{2}x + \pi\right) - 3$$

amp = —

Parent: $f(x) = \tan x$ $P = \pi$

P.S. = —

1) $f(x) = -\tan x$ r_x

2) $f(x) = -2 \tan x$ v.s. by 2

3) $f(x) = -2 \tan\left(\frac{1}{2}x\right)$ h.s. by 2 $P = 2\pi$

4) $f(x) = -2 \tan\left(\frac{1}{2}(x + 2\pi)\right)$ shift left 2π P.S. = -2π

5) $f(x) = -2 \tan\left(\frac{1}{2}x + \pi\right) - 3$ shift down 3

Write the transformations.

$$f(x) = \frac{3}{4} \sec\left(\frac{\pi}{3} - 2x\right) + 4$$

amp = —

Parent: $f(x) = \sec x$ $P = 2\pi$

P.S. = —

1) $f(x) = \sec(-x)$ r_y

2) $f(x) = \frac{3}{4} \sec(-x)$ v.c. by $\frac{3}{4}$

3) $f(x) = \frac{3}{4} \sec(-2x)$ h.c. by $\frac{1}{2}$ $P = \pi$

4) $f(x) = \frac{3}{4} \sec\left(-2\left(x - \frac{\pi}{6}\right)\right)$ shift right $\frac{\pi}{6}$

5) $f(x) = \frac{3}{4} \sec\left(\frac{\pi}{3} - 2x\right) + 4$ shift up 4 $P.S. = \frac{\pi}{6}$

Write each function as a composite of its transformations.

$$1) y = 3 + 2 \sin(x + \pi)$$

$$6) y = -\frac{1}{2} + 2 \tan(x - 3)$$

$$2) y = -1 - \frac{1}{2} \sin\left(2x - \frac{\pi}{4}\right)$$

$$7) y = -2 - \frac{5}{2} \csc\left(-\frac{1}{4}x - \frac{\pi}{8}\right)$$

$$3) y = 4 \sin\left(\frac{1}{2}x + \pi\right) - 2$$

$$8) y = \frac{5}{3} \sec\left(-\frac{2\pi}{3}x + 2\right)$$

$$4) y = -3 \sin(-3x - 1) + 1$$

$$9) y = -5 \cot(-2\pi x)$$

$$5) y = 5 - \frac{3}{4} \cos\left(x + \frac{\pi}{2}\right)$$

$$10) y = \cos\left(\frac{3\pi}{2}x - \frac{\pi}{2}\right)$$