Mr. Lamont presents:

"Can't you count to 4?"

	$\sin\theta$	$\cos\theta$	$\tan\theta$
0	$\sqrt{0}/2 = 0$	1	0
$\frac{\pi}{6}$ 30	$\sqrt{1}/2 = 1/2$	$\sqrt{3}/2$	$\frac{1}{\cancel{2}} \times \frac{\cancel{2}}{\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
$\frac{\pi}{4}$ 45	$\sqrt{2}/2 = \sqrt{2}/2$	$\sqrt{2}/2$	1
$\frac{\pi}{3}$ 60	$\sqrt{3}/2 = \sqrt{3}/2$	$1/2$	$\frac{\sqrt{3}}{\cancel{2}} \times \frac{2}{1} = \sqrt{3}$
$\frac{\pi}{2}$ 90	$\sqrt{4}/2 = 1$	0	undefined

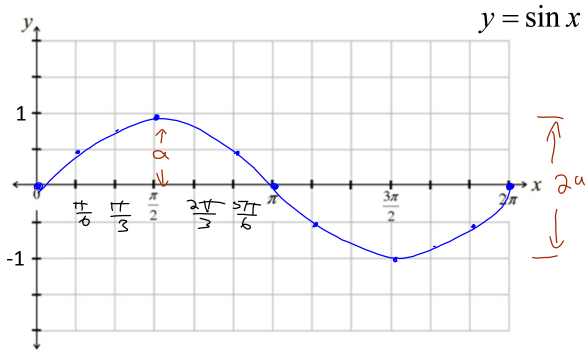
6.3 Exploring Graphs of the Primary Trigonometric Functions

Math Learning Target:
"I can use radians to graph the primary trigonometric functions.
Also, I can create formulas that describe the location of various properties of these functions, such as zeros, minimum values, maximum values, etc."

1. Complete the table, except for the last row.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\sin x$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$\frac{-1}{2}$	$-\frac{\sqrt{2}}{2}$	$\frac{-\sqrt{3}}{2}$	-1	$\frac{-\sqrt{3}}{2}$	$\frac{-\sqrt{2}}{2}$		0
$\cos x$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$\frac{-1}{2}$	$\frac{-\sqrt{2}}{2}$	$\frac{-\sqrt{3}}{2}$	-1	$\frac{-\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$\frac{-1}{2}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$		1
$\frac{\sin x}{\cos x}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined	$-\sqrt{3}$	-1	$\frac{-\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined	$-\sqrt{3}$	-1		
x		30°	45°	60°													

2. ***Recall***: $\tan x = \frac{\sin x}{\cos x}$. Graph all three primary trigonometric functions (increments of $\frac{\pi}{6}$ radians) on separate grids. Complete the properties in the table for each function.



$y = \frac{max + min}{2}$

Period: 2π

Equaon of horizontal axis: $y = 0$

Amplitude: 1 $a = \frac{max - min}{2}$

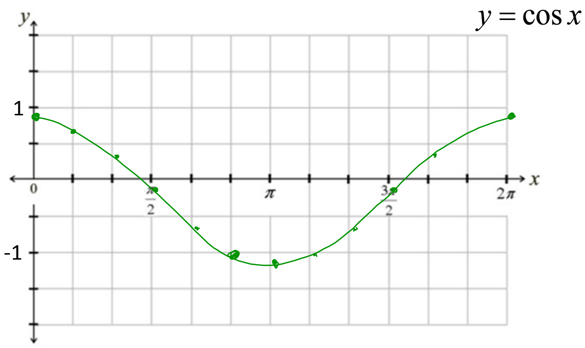
Minimum Value: -1

Maximum Value: 1

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$

Zeros: $0, \pi, 2\pi, \ldots$



Period: 2π

Equaon of horizontal axis: $y = 0$

Amplitude: 1

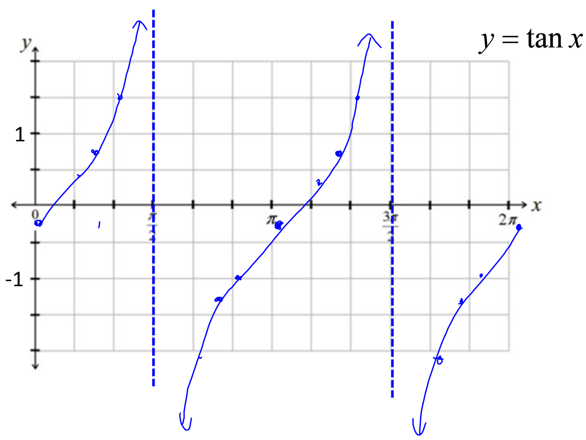
Minimum Value: -1

Maximum Value: 1

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$

Zeros: $\frac{\pi}{2}, \frac{3\pi}{2}, \ldots$



Period: π

Equaon of horizontal axis: none

Amplitude: undefined

Minimum Value: none

Maximum Value: none

Domain: $[0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \frac{3\pi}{2}) \cup (\frac{3\pi}{2}, 2$

Range: $(-\infty, \infty)$

Zeros: $0, \pi, 2\pi, \ldots$

Asymptotes: $x = \frac{\pi}{2}, \frac{3\pi}{2}, \ldots$

Recall:

The general term of an arithmetic sequence...

$t_n = a + (n-1)d$ where a is the first term and d is what the sequence terms increase or decrease by.
← common difference

3. It is more precise to write a set of values as a formula or expression. For example, the set of numbers {2, 4, 6, 8, 10, ...} can be expressed as the expression $2n$, where n is an integer beginning at 1.
Note: there are many formulas that can be found for this example!
Let's determine some other ways...

$\{n \in \mathbb{Z} \mid 2n, n \geq 1\}$

$\{n \in \mathbb{Z} \mid 2n-4, n \geq 3\}$

$\{n \in \mathbb{N} \mid 2n-6, n \geq 4\}$

$\{n \in \mathbb{N} \mid 2n\}$

$\{n \in \mathbb{Z} \mid 2n+2, n \geq 0$

$2n+8$

4. Create any formula that determines all values in the Domain for $y = \tan x$.
Note: there are many formulas that could work!

$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}$

$\{x \in \mathbb{R} \mid x \neq \frac{(2k+1)\pi}{2}, k \in \mathbb{Z}\}$

$\cancel{\frac{2k\pi}{2}} + \frac{\pi}{2}$

$\{x \in \mathbb{R} \mid x \neq \frac{2k\pi + \pi}{2}, k \in \mathbb{Z}\}$

$2n+1$

$2n-1$

$\{x \in \mathbb{R} \mid x \neq \frac{\pi}{2} + k\pi, k \in \mathbb{Z}\}$

Entertainment: p. 336 #2c, 3, 5