Math 1060Q Lecture 15

Jeffrey Connors

University of Connecticut

October 22, 2014

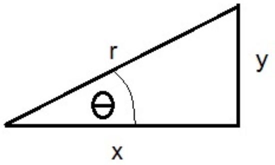
Some other trig. functions: tan(θ), sec(θ), csc(θ), cot(θ)

- Definitions in terms of sin(θ), cos(θ).
- Calculation of values at our special angles.
- Graphs of these functions.

The tangent function is denoted by $\tan(\theta)$.

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}.$$

In terms of triangles, think "opposite over adjacent";



- $\tan(\theta) = y/x$.
- Note that $\tan(\theta)$ is not defined when $\cos(\theta) = 0$, which means for $\theta = (2k-1)\pi/2$ (k is any integer).

The "co-functions" are reciprocals.

- The secant function is

$$\sec(\theta) = \frac{1}{\cos(\theta)}.$$

- The cosecant function is

$$\csc(\theta) = \frac{1}{\sin(\theta)}.$$

- The cotangent function is

$$\cot(\theta) = \frac{1}{\tan(\theta)} = \frac{\cos(\theta)}{\sin(\theta)}.$$

If you can calculate $\sin(\theta)$ and $\cos(\theta)$, then $\tan(\theta)$ and the co-functions are easy to find from the formulas.

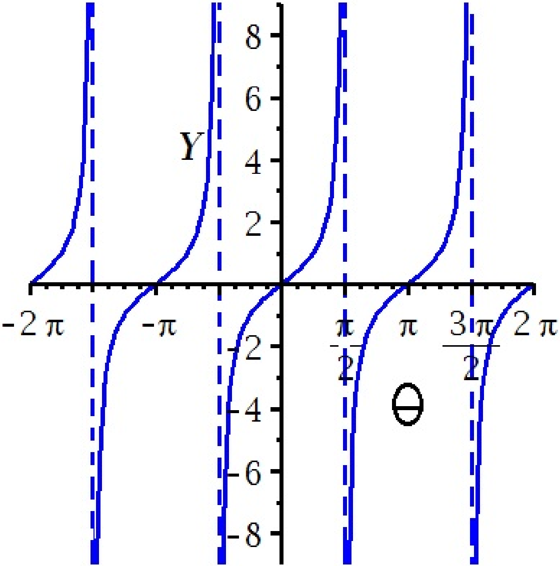
- Definitions in terms of sin(θ), cos(θ).
- Calculation of values at our special angles.
- Graphs of these functions.

The last four rows in the table may found from the first two rows.

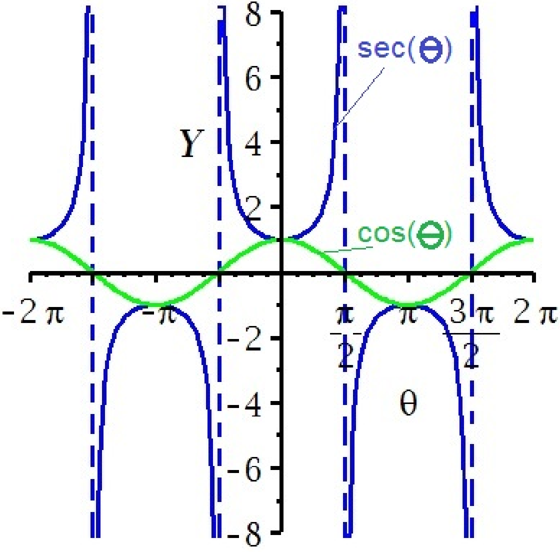
θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin(\theta)$	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1
$\cos(\theta)$	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0
$\tan(\theta)$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	—
$\csc(\theta)$	—	2	$\sqrt{2}$	$2/\sqrt{3}$	1
$\sec(\theta)$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	—
$\cot(\theta)$	—	$\sqrt{3}$	1	$1/\sqrt{3}$	0

- Definitions in terms of sin(θ), cos(θ).
- Calculation of values at our special angles.
- Graphs of these functions.

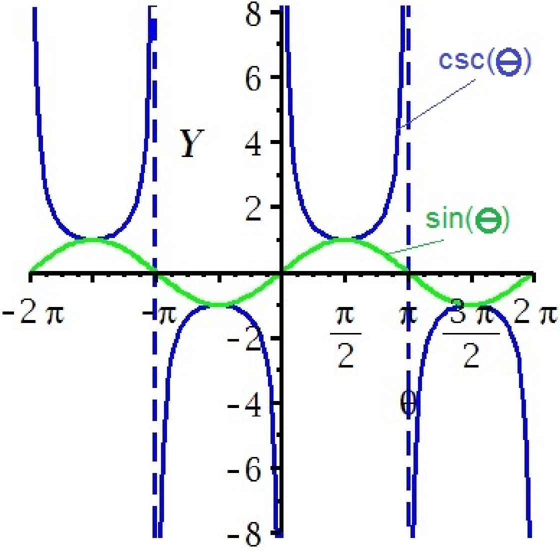
The graph of $\tan(\theta)$. Note the domain and shape.



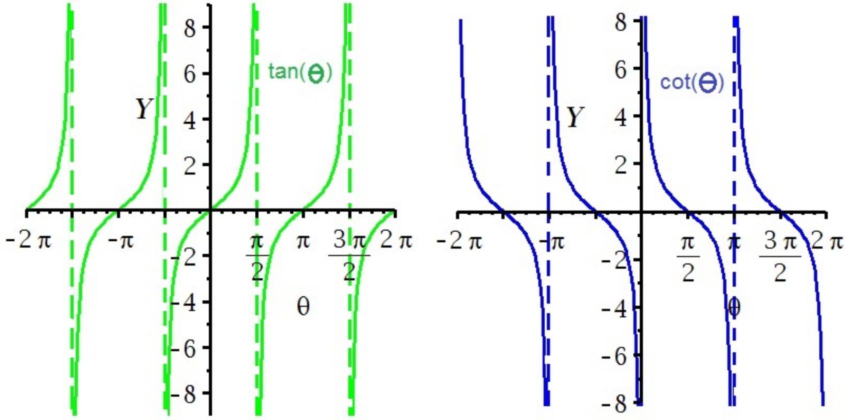
The graph of sec(θ). This is not hard if you understand our previous discussion of graphing a reciprocal.



Since $\sin(\theta)$ is just $\cos(\theta)$ shifted by $\pi/2$ units, $\csc(\theta)$ and $\sec(\theta)$ have the same relationship.



Similarly, the graph of cot(θ) may be derived from the graph of tan(θ), but you don't want to display these together (messy).



Practice!

Problem L15.1: Fill in the table:

θ	$2\pi/3$	$5\pi/4$	$-\pi/2$	$-\pi/6$
$\tan(\theta)$				
$\csc(\theta)$				
$\sec(\theta)$				
$\cot(\theta)$				

Practice!

Problem L15.1: Fill in the table:

θ	$2\pi/3$	$5\pi/4$	$-\pi/2$	$-\pi/6$
$\tan(\theta)$	$-\sqrt{3}$	1	—	$-1/\sqrt{3}$
$\csc(\theta)$	$2/\sqrt{3}$	$-\sqrt{2}$	-1	-2
$\sec(\theta)$	-2	$-\sqrt{2}$	—	$2/\sqrt{3}$
$\cot(\theta)$	$-1/\sqrt{3}$	1	0	$-\sqrt{3}$