

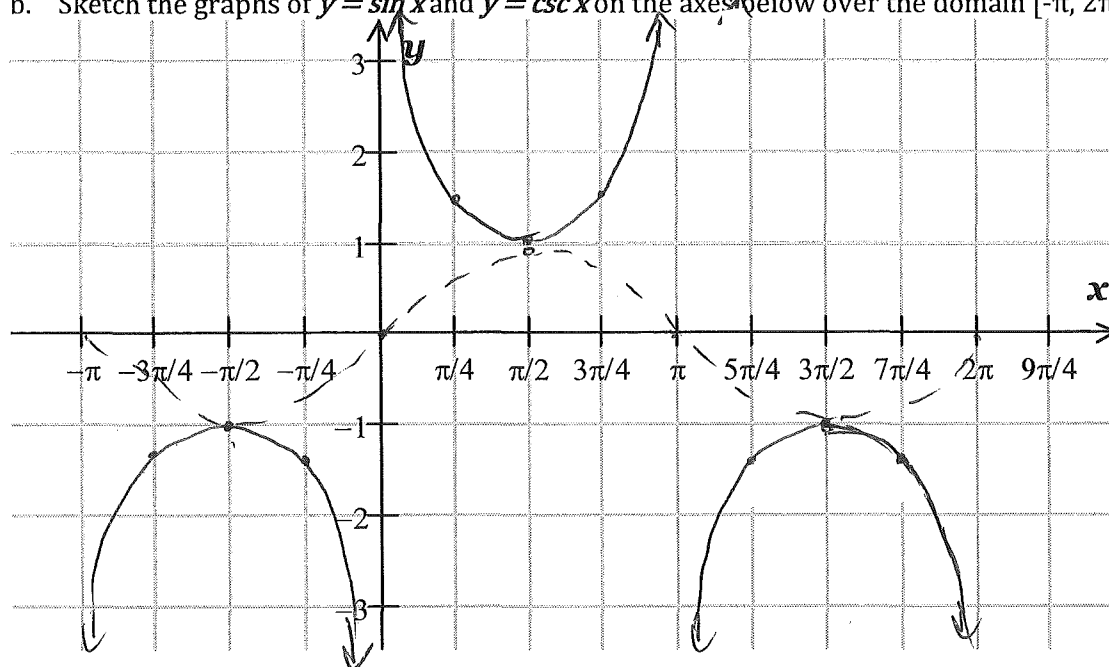
## Day 3: 5.2 – Graphs of Reciprocal Functions

EX 1- Graph of  $y = \sin x$  &  $y = \csc x$

a. Fill in the table of values below.

$\sin 0$	$\sin \frac{\pi}{4}$	$\sin \frac{\pi}{2}$	$\sin \frac{3\pi}{4}$	$\sin \pi$	$\sin \frac{5\pi}{4}$	$\sin \frac{3\pi}{2}$	$\sin \frac{7\pi}{4}$	$\sin 2\pi$
0	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{2}$	0	$-\frac{\sqrt{2}}{2}$	-1	$-\frac{\sqrt{2}}{2}$	0
$\csc 0$	$\csc \frac{\pi}{4}$	$\csc \frac{\pi}{2}$	$\csc \frac{3\pi}{4}$	$\csc \pi$	$\csc \frac{5\pi}{4}$	$\csc \frac{3\pi}{2}$	$\csc \frac{7\pi}{4}$	$\csc 2\pi$
undefined VA	1.41	1	1.41	und. VA	-1.41	-1	-1.41	und VA

b. Sketch the graphs of  $y = \sin x$  and  $y = \csc x$  on the axes below over the domain  $[-\pi, 2\pi]$



c. State the key properties for  $y = \csc x$  (in radians).

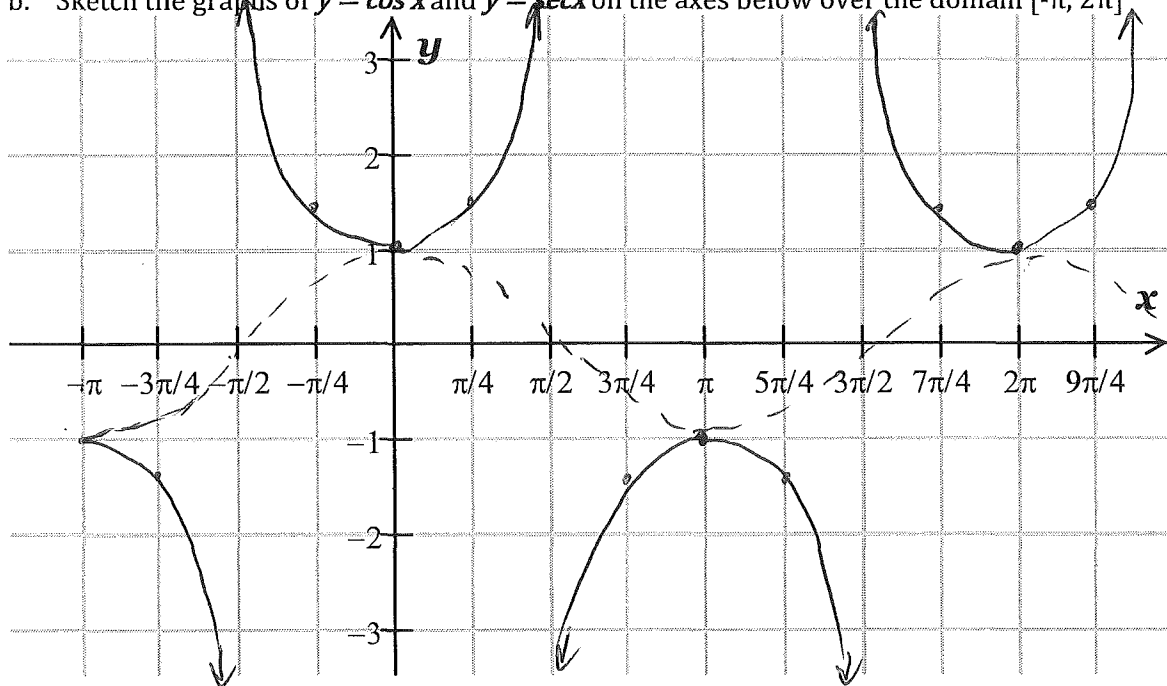
Amplitude	Period	x-intercepts
NA	$2\pi$ rad	NONE
Domain		Range
$\{x \in \mathbb{R} \mid x \neq k\pi, k \in \mathbb{Z}\}$		$\{y \in \mathbb{R} \mid y \geq 1 \text{ or } y \leq -1\}$

EX 2- Graph of  $y = \cos x$  &  $y = \sec x$

a. Fill in the table of values below.

$\cos 0$	$\cos \frac{\pi}{4}$	$\cos \frac{\pi}{2}$	$\cos \frac{3\pi}{4}$	$\cos \pi$	$\cos \frac{5\pi}{4}$	$\cos \frac{3\pi}{2}$	$\cos \frac{7\pi}{4}$	$\cos 2\pi$
1	$\frac{\sqrt{2}}{2}$	0	$-\frac{\sqrt{2}}{2}$	-1	$-\frac{\sqrt{2}}{2}$	0	$\frac{\sqrt{2}}{2}$	1
$\sec 0$	$\sec \frac{\pi}{4}$	$\sec \frac{\pi}{2}$	$\sec \frac{3\pi}{4}$	$\sec \pi$	$\sec \frac{5\pi}{4}$	$\sec \frac{3\pi}{2}$	$\sec \frac{7\pi}{4}$	$\sec 2\pi$
1	1.41	unde VA	-1.41	-1	-1.41	unde VA	1.41	1

b. Sketch the graphs of  $y = \cos x$  and  $y = \sec x$  on the axes below over the domain  $[-\pi, 2\pi]$



c. State the key properties for  $y = \sec x$  (in radians).

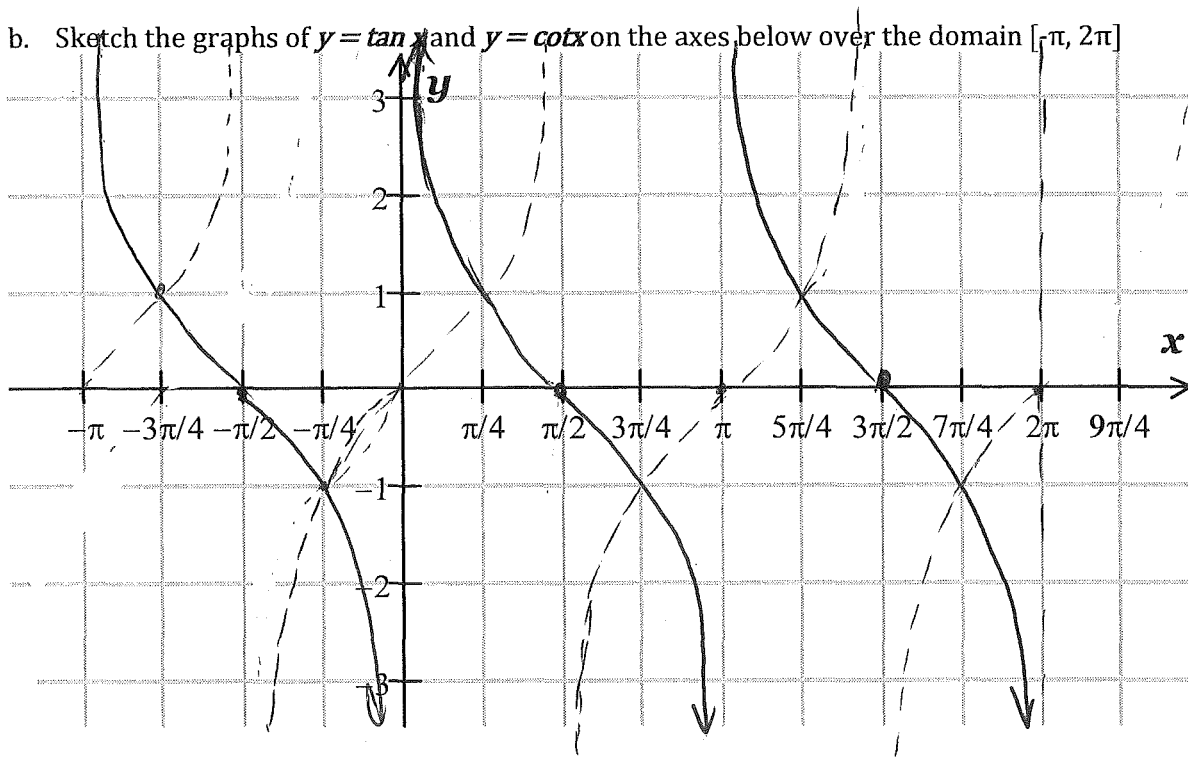
Amplitude	Period	x-intercepts
NA	$2\pi$ rad	NONE
Domain	Range	
$\{x \in \mathbb{R} \mid x \neq \frac{\pi}{2} + k\pi, k \in \mathbb{Z}\}$	$\{y \in \mathbb{R} \mid y \geq 1 \text{ or } y \leq -1\}$	

EX 3- Graph of  $y = \tan x$  &  $y = \cot x$

a. Fill in the table of values below.

$\tan 0$	$\tan \frac{\pi}{4}$	$\tan \frac{\pi}{2}$	$\tan \frac{3\pi}{4}$	$\tan \pi$	$\tan \frac{5\pi}{4}$	$\tan \frac{3\pi}{2}$	$\tan \frac{7\pi}{4}$	$\tan 2\pi$
0	1	$\frac{1}{0}$ undefined	-1	0	1	$\frac{1}{0}$ undefined	-1	0
$\cot 0$	$\cot \frac{\pi}{4}$	$\cot \frac{\pi}{2}$	$\cot \frac{3\pi}{4}$	$\cot \pi$	$\cot \frac{5\pi}{4}$	$\cot \frac{3\pi}{2}$	$\cot \frac{7\pi}{4}$	$\cot 2\pi$
und VA	1	0	-1	und VA	1	0	-1	und VA

b. Sketch the graphs of  $y = \tan x$  and  $y = \cot x$  on the axes below over the domain  $[-\pi, 2\pi]$



c. State the key properties for  $y = \cot x$  (in radians).

Amplitude	Period	x-intercepts
NA	$\pi$ radians	$x = \frac{\pi}{2} + k\pi, k \in \mathbb{Z}$
Domain		Range
$\{x \in \mathbb{R} \mid x \neq k\pi, k \in \mathbb{Z}\}$		$\{y \in \mathbb{R}\}$

EX 4 - Explain the difference between  $\sec \frac{1}{2}$  and  $\cos^{-1}\left(\frac{1}{2}\right)$ .

$\sec \frac{1}{2} = \frac{1}{\cos\left(\frac{1}{2}\right)}$  where  $\cos^{-1}\left(\frac{1}{2}\right)$  means cosine inverse of 0.5.

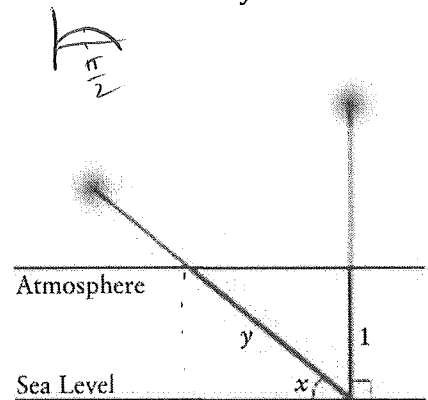
EX 5 - When the Sun is directly overhead, its rays pass through the atmosphere as shown in the picture. Call this 1 unit of atmosphere. When the Sun is not overhead, but is inclined at an angle of  $x$  to the surface of Earth, its rays pass through more air before they reach sea level. Call this  $y$  units of atmosphere. The value of  $y$  affects the temperature at the surface of Earth.

- a) Use the diagram to determine an expression for  $y$  in terms of angle  $x$ .

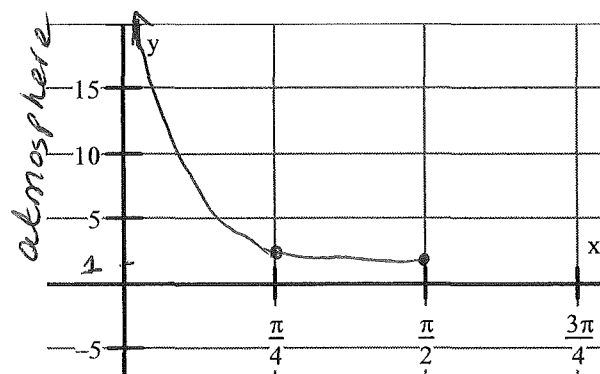
$$\sin x = \frac{1}{y}$$

$$y = \frac{1}{\sin x}$$

$$= \csc x$$



- b) Graph  $y = f(x)$  on the interval  $\left[0, \frac{\pi}{2}\right]$



- c) Describe what happens to the value of  $y$  as  $x$  approaches 0. Why does this make sense?

$y$  approaches  $\infty$ . This makes sense because at noon, it's very bright.