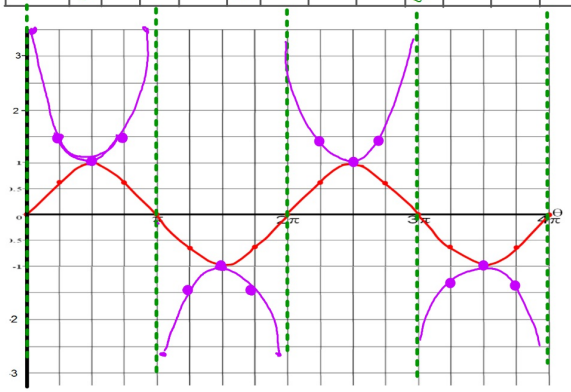
θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$	$\frac{5\pi}{2}$	$\frac{11\pi}{4}$	3π	$\frac{13\pi}{4}$	$\frac{7\pi}{2}$	$\frac{15\pi}{4}$	4π
Sinθ	0	.71	1	.71	0	-.71	-1	-.71	0	.71	1	.71	0	-.71	-1	-.71	0
Cscθ	undef	1.41	1	1.41	undef	-1.41	-1	-1.41	undef	1.41	1	1.41	undef	-1.41	-1	-1.41	undef

These values are the reciprocal of the Sin values.



Sinθ is graphed in Red
Cscθ is graphed in Pink

Y = aSinbx Y = aCosbx

What is the period of these two functions?

Period = $\frac{2\pi}{b}$

Y = aCscbx Y = aSecbx

What is the period of these two functions?

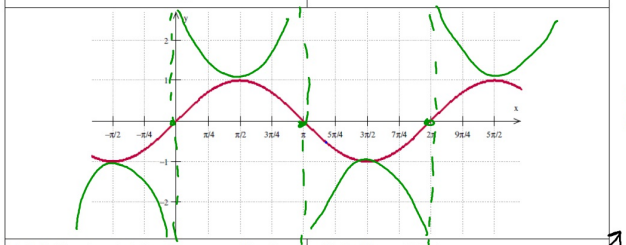
Period = $\frac{2\pi}{b}$

A Cosecant Function

The cosecant function is the reciprocal of the sine function:

$$\csc(x) = \frac{1}{\sin(x)}$$

Ex 1. In the following figure is represented graphically the sine function. Graph the cosecant function $\csc(x) = \frac{1}{\sin(x)}$ on the same grid.



Ex 2. List the characteristics of the cosecant function.

Domain All Real #'s except when Sinx=0

Range

y≤ - 1, y≥ 1

(-∞,-1] U [1,∞)

Vertical Asymptote(s)

When Sinx=0

Zero(s) None

Minimum/maximum point(s)

Period 2π

Cscx has NO Absolute Max or Min.

Cscx has a Local Min when Sinx has a Local Max.

Cscx has a Local Max when Sinx has a Local Min.

On your calculator use the following window:

x:[0,4π] y:[-3,3]

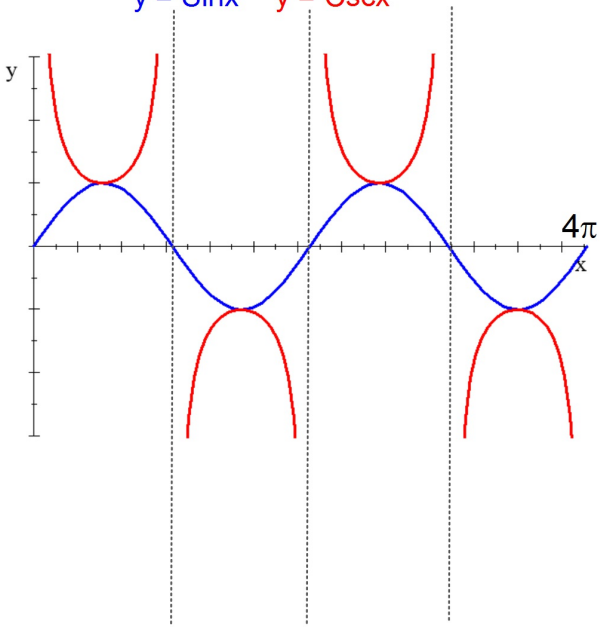
Graph these functions:

Y_1 = Sinx

Y_2 = Cscx

Graphs of the Inverse Trig Functions: y = Cscx

y = Sinx y = Cscx



VA:

Where Sinx=0

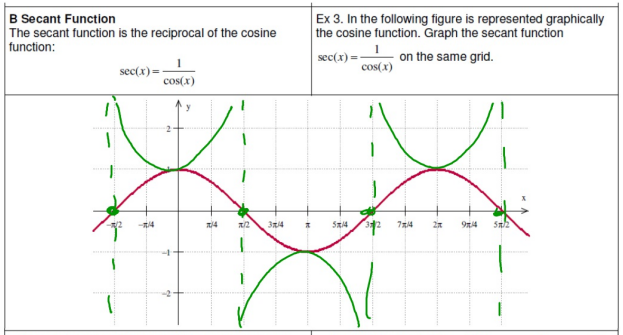
Local Max:

Where Sinx is a MIN

Local Min:

Where Sinx is a MAX

Period of Cscx: 2π



Secx has NO Absolute Max or Min.

Secx has a Local Min when Cosx has a Local Max.

Secx has a Local Max when Cosx has a Local Min.

On your calculator use the following window:

x:[0,4π] y:[-3,3]

Make sure the calculator is in Radians.

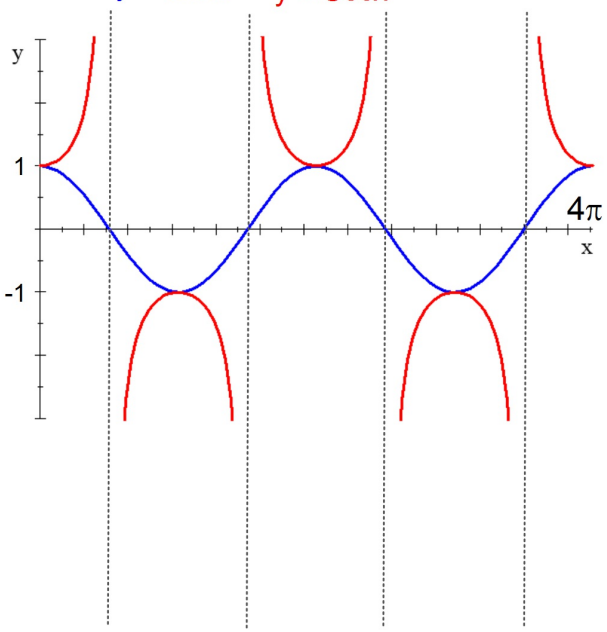
Graph these functions:

Y_1 = Cosx

Y_2 = Secx

Graphs of the Inverse Trig Functions: y = Secx

y = Cosx y = Secx



VA:

Where Cosx=0

Local Max:

Where Cosx is a MIN

Local Min:

Where Cosx in a MAX

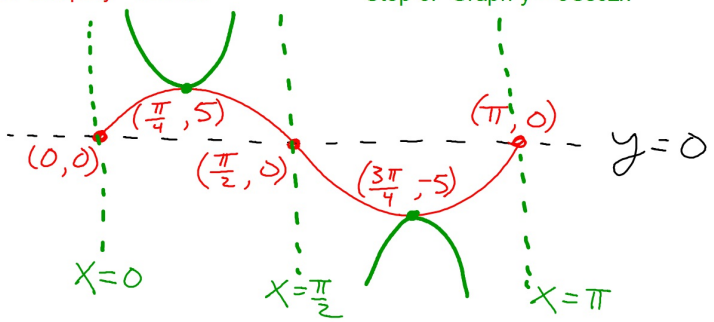
Period of Secx: 2π

Sketch one period of y = 5Csc(2x). Label the coordinates of the Max, Min, and identify the VA. → $y = 5\sin(2x)$

Step 1: Find these. for Sin Amplitude = 5 Period = π Midline: $y = 0$ Phase Shift: None

Step 2: Graph y = 5Sin2x

Step 3: Graph y = 5Csc2x



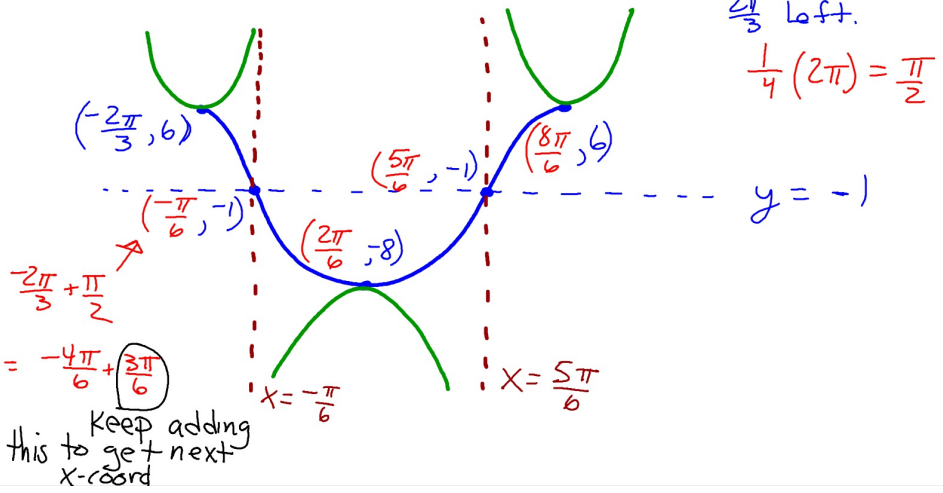
Sketch one period of the function below. Label the coordinates of the Max, Min, and identify the VA.

$y = 7\text{Sec}(x + \frac{2\pi}{3}) - 1$ → $y = 7\cos(x + \frac{2\pi}{3}) - 1$

- Graph of Cos in blue
- Graph of Sec in green

period = 2π amp = 7 midline: $y = -1$ phase shift: $\frac{2\pi}{3}$ left.

$\frac{1}{4}(2\pi) = \frac{\pi}{2}$



$\frac{-2\pi}{3} + \frac{\pi}{2}$

$= \frac{-4\pi}{6} + \frac{3\pi}{6}$

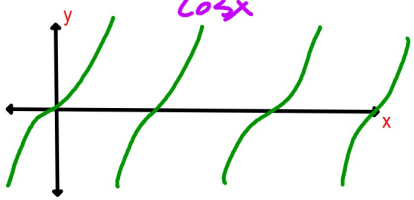
Keep adding this to get next x-coord

What is the Domain and Range of Tanx? = $\frac{\sin x}{\cos x}$

Tanx:

Domain:

All real #'s except when Cosx = 0.



Range:

All Real #'s

$(-\infty, \infty)$

Where are the x-int and VA of Tanx? = $\frac{\sin x}{\cos x}$

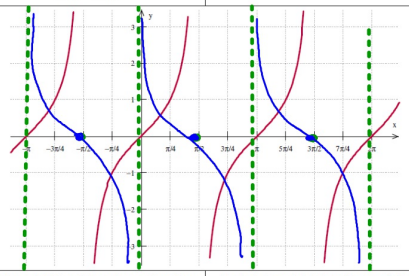
x-int: When Sinx=0

VA: When Cosx = 0

C Cotangent Function
The cotangent function is the reciprocal of the tangent function:

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

Ex 5. In the following figure is represented graphically the tangent function. Graph the cotangent function $\cot(x) = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)}$ on the same grid.



Ex 6. List the characteristics of the cotangent function.

a) Domain All real #'s except when Sinx= 0

b) Range All Real #'s $(-\infty,\infty)$

Vertical Asymptote(s) when Sinx = 0

Zero(s) When Cosx = 0

Minimum/maximum point(s) None

Period π

$\tan = \frac{\sin}{\cos}$

$\cot = \frac{\cos}{\sin}$

What is the Domain and Range of Cotx?

Tanx: $= \frac{\sin x}{\cos x}$

Domain:

All real #'s except when Cosx = 0.

Range:

All Real #'s

$(-\infty,\infty)$

Cotx: $= \frac{\cos x}{\sin x}$

Domain:

All real #'s except when Sinx = 0.

Range:

All Real #'s

$(-\infty,\infty)$

Where are the x-int and VA of Cotx?

Tanx:

x-int: When Sinx=0

VA: When Cosx = 0

Cotx:

x-int:

- When Cosx = 0
- When Tanx has VA

VA:

- When Sinx = 0
- When Tanx has x-int

On your calculator use the following window:

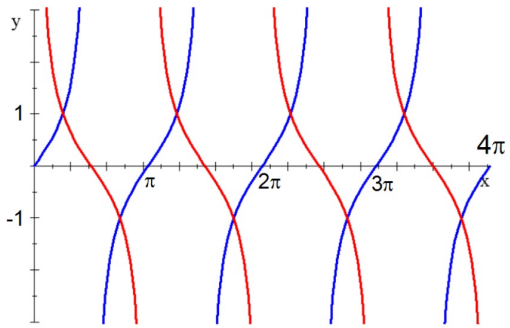
x:[0,4π] y:[-3,3]

Graph these functions:

Y_1 = Tanx

Y_2 = Cotx

y = Tanx y = Cotx $y = \text{Cotx} = \frac{\text{Cosx}}{\text{Sinx}}$



VA for Cotx:
Where Sinx = 0
Where Tanx = 0

Zeros for Cotx:
Where Cosx = 0
Where Tanx has VA

Period of Cotx: π

Period for Tanx and Cotx:

y = Tanbx

Period = $\frac{\pi}{b}$

→

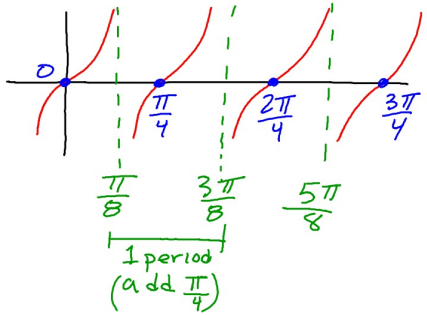
y = Cotbx

Period = $\frac{\pi}{b}$

State 5 VA and 5 x-intercepts for this function: y = Cot4x

Step 1: Find Period $\frac{\pi}{4}$

Step 2: Sketch y = Tan4x →



Step 3: Find x-int and VA of y=Tan4x

X-int: $0, \pm\frac{\pi}{4}, \pm\frac{2\pi}{4}$

VA: $x = \pm\pi/8, \pm 3\pi/8, \pm 5\pi/8$

Step 4: x-int of Cot4x:
(VA of Tan4x) $x = \pm\pi/8, \pm 3\pi/8, \pm 5\pi/8$

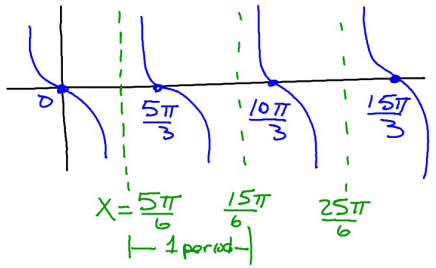
VA of Cot4x:
(x-int of Tan4x) $x = 0, \pm\frac{\pi}{4}, \pm\frac{2\pi}{4}$

State 5 VA and 5 x-intercepts for this function:

$y = -\text{Cot}\left(\frac{3x}{5}\right)$

↓

$y = -\text{Tan}\left(\frac{3x}{5}\right)$ period = $\frac{5\pi}{3}$



For Tan: x-int = $0, \pm\frac{5\pi}{3}, \pm\frac{10\pi}{3}$

VA: $x = \pm\frac{5\pi}{6}, \pm\frac{15\pi}{6}, \pm\frac{25\pi}{6}$

FOR COT $\frac{3x}{5}$

X-int: $x = \pm\frac{5\pi}{6}, \pm\frac{15\pi}{6}, \pm\frac{25\pi}{6}$
(Same as VA of Tan)

VA: $x = 0, \pm\frac{5\pi}{3}, \pm\frac{10\pi}{3}$
(Same as x-int of Tan)

You can now finish Hwk #23

Practice Sheet: Sec 13-8

Graphs of Reciprocal Trig Functions