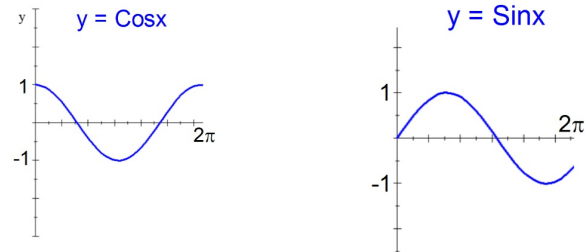## Why is the Sinx and Cosx never greater than 1?

Using the graphs of y=Sinx and y=Cosx

y = Cosx

y = Sinx

The highest either graph reaches is 1, therefore, neither Sinx nor Cosx will exceed 1.

Why is the Sinx and Cosx never greater than 1?

Using the Unit Circle (radius =1)

$Sin\theta = \dfrac{y}{r}$ $Cos\theta = \dfrac{x}{r}$

Since the largest x or y - coordinate is 1 and the the radius =1, both ratios must be ≤ 1.
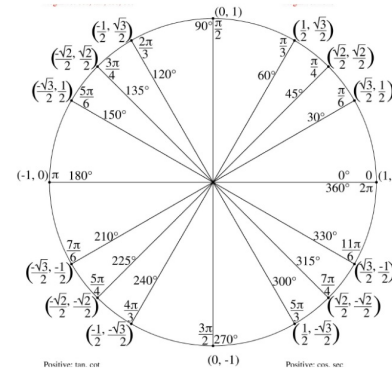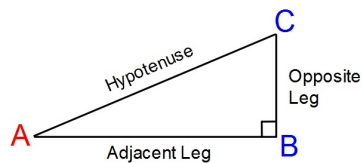
Why is the Sinx and Cosx never greater than 1?

Using a Right Triangle

$SinA = \dfrac{\text{Opposite Leg}}{\text{Hypotenuse}}$ $CosA = \dfrac{\text{Adjacent Leg}}{\text{Hypotenuse}}$

Since the Hypotenuse is longer than either leg, both fractions represent a number less than 1.

What is the Domain and Range of Sinx and Cosx?

Sinx:

Domain:

All Real #'s

$(-\infty, \infty)$

Range:

$-1 \leq y \leq 1$

$(-1, 1]$

Cosx:

Domain:

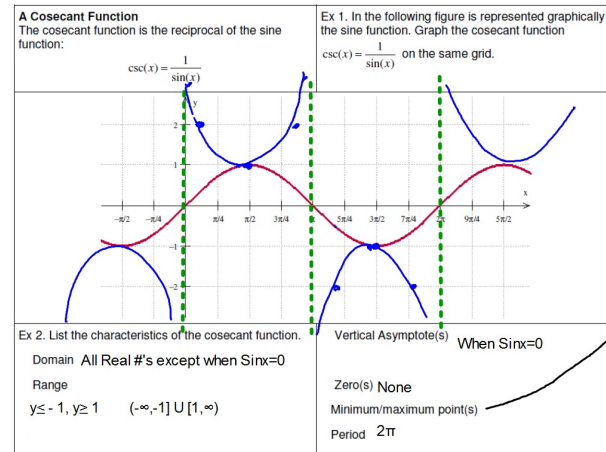All Real #'s

$(-\infty, \infty)$

Range:

$-1 \leq y \leq 1$

$(-1, 1]$

Therefore, what is true about the values of Secx and Cscx? (i.e. their range)

Since the range of Sinx and Cosx is $-1 \leq y \leq 1$
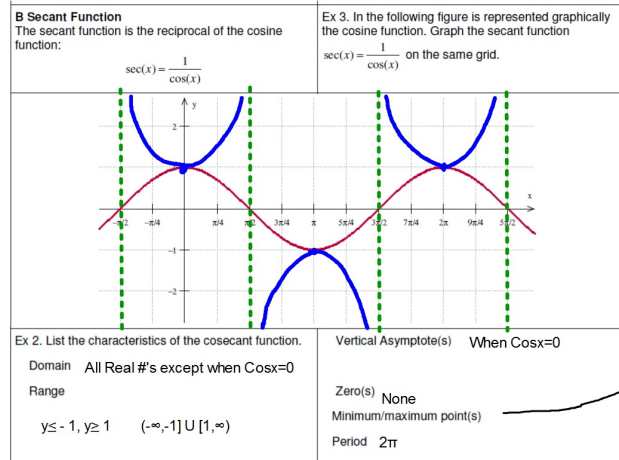
- When Sinx & Cosx = 0   Cscx and Secx are undefined

- When Sinx & Cosx = 1 or -1   Cscx and Secx = 1 or -1

- As Sinx and Cosx move from 1 towards 0
    Cscx and Secx get bigger and bigger

- As Sinx and Cosx move from -1 towards 0
    Cscx and Secx get bigger and bigger but stay negative.

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

$y \leq -1, y \geq 1$ $(-\infty, -1] \cup [1, \infty)$

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.

B Secant Function
The secant function is the reciprocal of the cosine function:

$$sec(x) = \frac{1}{\cos(x)}$$

Ex 3. In the following figure is represented graphically the cosine function. Graph the secant function

$$sec(x) = \frac{1}{\cos(x)}$$ on the same grid.

Ex 2. List the characteristics of the cosecant function.

Domain All Real #'s except when Cosx=0

Range

$y \leq -1, y \geq 1$ $(-\infty, -1] \cup [1, \infty)$

Vertical Asymptote(s) When Cosx=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.

What is the Domain and Range of Secx and Cscx?

Secx:

Domain:

All real #'s except where Cosx is zero

Range:

$y \leq -1, y \geq 1$

$(-\infty, -1] \cup [1, \infty)$

Cscx:

Domain:

All real #'s except where Sinx is zero

Range:

$y \leq -1, y \geq 1$

$(-\infty, -1] \cup [1, \infty)$