UNIT 2 LESSONS 1-3

PRECALCULUS B

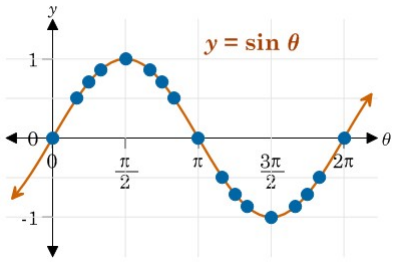
LESSONS:

- Graphs of Trig Functions
- Domain and Range
- Behavior of Trig Functions
  - Even or Odd … this week
  - Period and Amplitude … next week

Graphing from a Table:

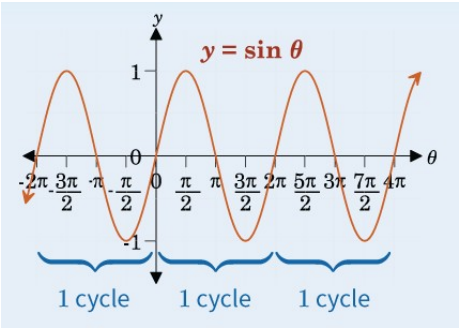
- Plug in numbers
- Calculate the output
- Plot the points
- Connect the dots

Quadrant	θ	$y = \sin\theta$
n/a	0	0
I	$\frac{\pi}{6}$	0.5
I	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} \approx 0.707$
I	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2} \approx 0.866$
n/a	$\frac{\pi}{2}$	1
II	$\frac{2\pi}{3}$	$\frac{\sqrt{3}}{2} \approx 0.866$
II	$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2} \approx 0.707$



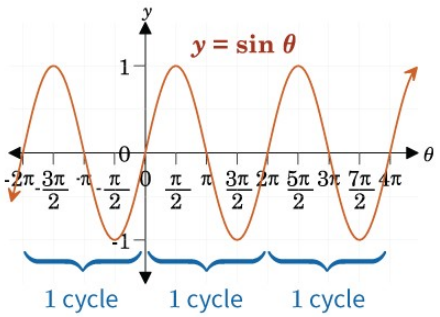
Sine ~ sinθ

- The y value increases from 0 to 1, then decreases from 1 to -1, then increases from -1 to 0.
- This completes one cycle, that then repeats infinitely.
- The length of one sine cycle is 2π.



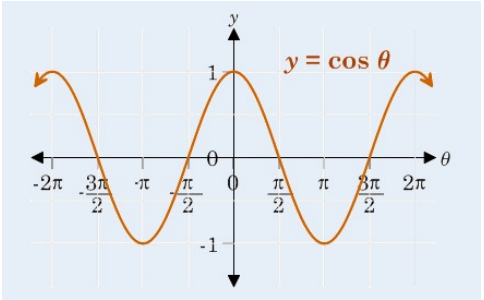
"Oscillate"

- When a function alternates between high and low.
- We say this one oscillates about the line y = 0 with a maximum of y = 1 and a minimum of y = -1.



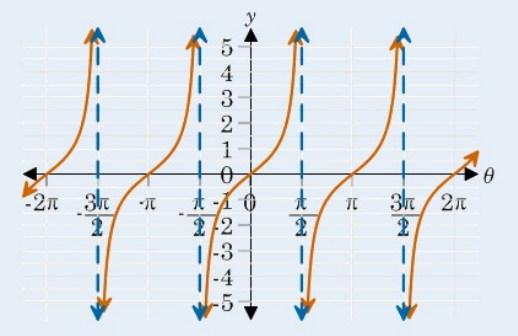
Cosine ~ cosθ

- The y value decreases from 1 to -1, then increases from -1 to 1.
- This completes one cycle, that then repeats infinitely.
- The length of one cosine cycle is also 2π.



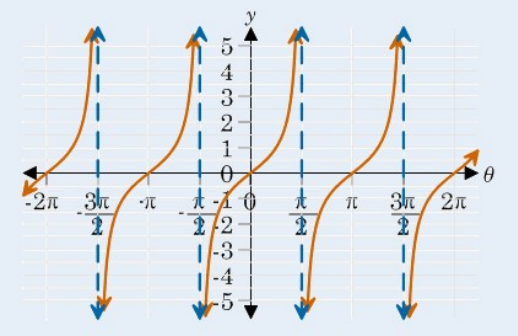
Tangent ~ tanθ

- The y value increases between the asymptote lines.
- The asymptote lines are 1π apart, and define the cycle.
- This is not an oscillation; there is no max or min.



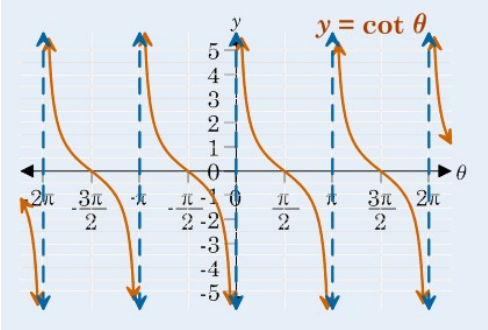
Tangent ~ tanθ

- Tan = sin/cos
- So, since we can't divide by 0, any place cosine equals 0 makes tangent undefined!!



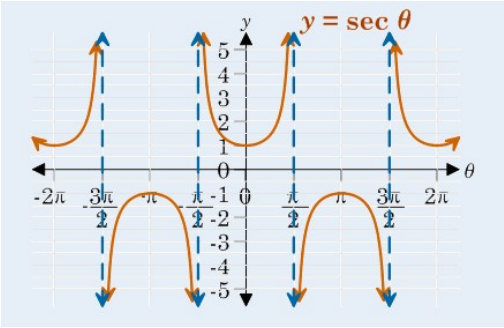
Cotangent ~ cotθ

- The y value decreases between the asymptote lines.
- The asymptote lines are 1π apart, and define the cycle.
- This is not an oscillation; there is no max or min.



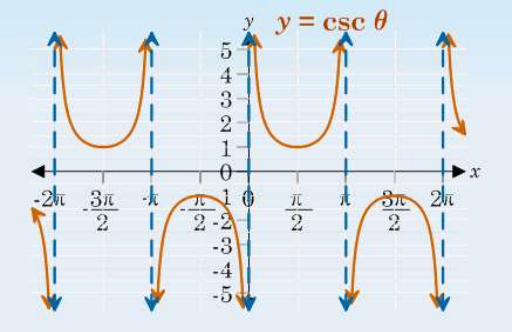
Secant ~ secθ

- The y value increases from 1 to ∞ and -∞ to -1, then decreases from -1 to -∞ and +∞ to 1.
- The asymptote lines are 1π apart, but the cycle takes 2π.
- This is not an oscillation; there is no max or min.



Cosecant ~ cscθ

- The y value decreases from +∞ to 1, then increases from 1 to +∞ and from -∞ to -1, then decreases from -1 to -∞.
- The asymptote lines are 1π apart, but the cycle takes 2π.
- This is not an oscillation; there is no max or min.



REVIEW

The six trigonometric functions can be paired up as cofunctions or as reciprocal functions.

SORT THEM AS RECIPROCAL PAIRS …

REVIEW

The six trigonometric functions can be paired up as cofunctions or as reciprocal functions.

SORT THEM AS RECIPROCAL PAIRS …

SIN = 1/CSC

CSC = 1/SIN

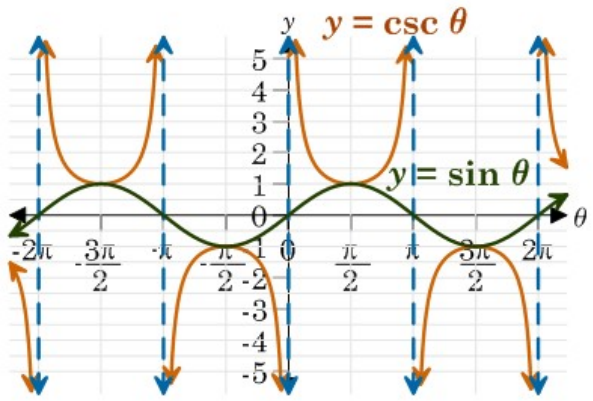
COS = 1/SEC

SEC = 1/COS

TAN = 1/COT

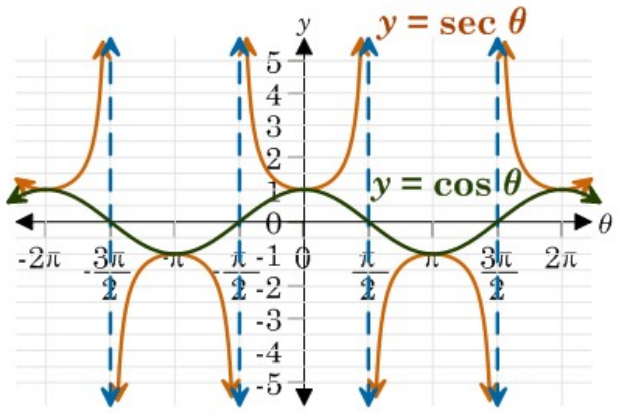
COT = 1/TAN

SIN = 1/CSC CSC = 1/SIN



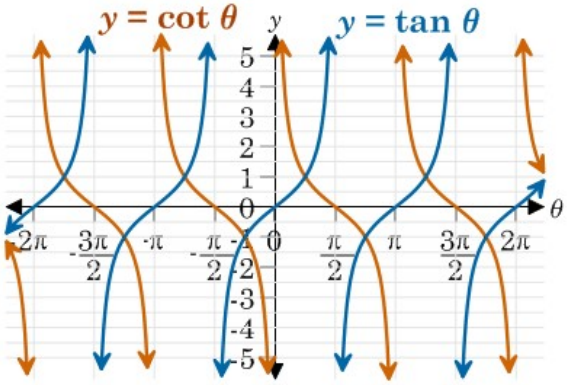
See how the lengths of the cycles match, but the increasing and decreases reverses!

COS = 1/SEC SEC = 1/COS



See how the lengths of the cycles match, but the increasing and decreases reverses!

TAN = 1/COT COT = 1/COT



See how the lengths of the cycles match, but the increasing and decreases reverses!

REVIEW

DEFINE THESE…

DOMAIN vs RANGE

REVIEW

DEFINE THESE…

DOMAIN vs RANGE

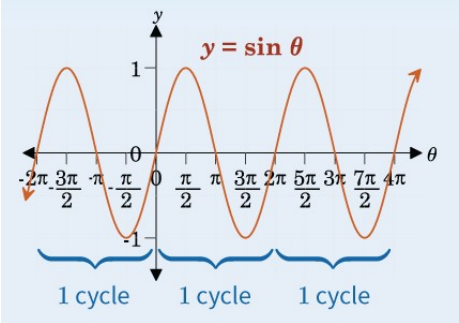
INPUT vs OUTPUT

X-VALUES vs Y-VALUES

Notice these are each alphabetical ☺

Sine ~ sinθ

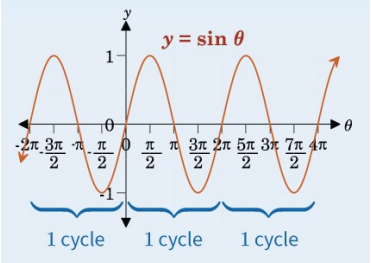
What is the domain? What is the range?



Sine ~ sinθ

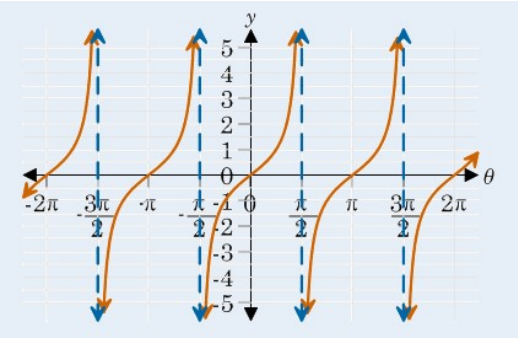
What is the domain? What is the range?

Notation	Domain	Range
inequality	$-\infty < x < \infty$	$-1 \le y \le 1$
interval	$(-\infty, \infty)$	$[-1, 1]$



Tangent ~ tanθ

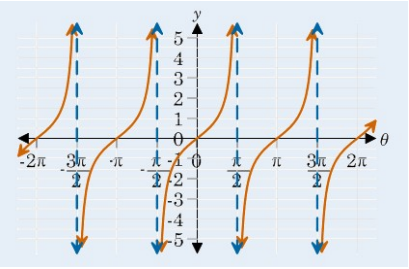
What is the domain? What is the range?



Tangent ~ tanθ

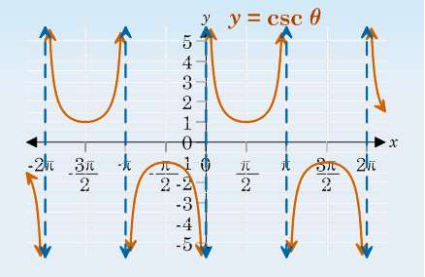
What is the domain? What is the range?

Notation	Domain	Range
inequality	$-\infty < x < \infty,\ x \neq \frac{\pi}{2} + n\pi$, where n is an integer	$-\infty < y < \infty$
interval	$(-\infty, \infty)$, except $\frac{\pi}{2} + n\pi$, where n is an integer	$(-\infty, \infty)$



Cosecant ~ cscθ

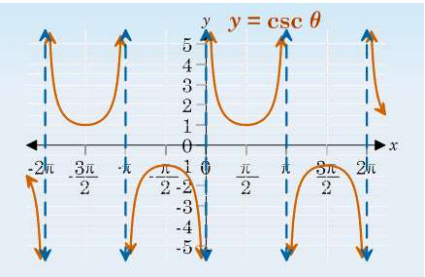
What is the domain? What is the range?



Cosecant ~ cscθ

What is the domain? What is the range?

Notation	Domain	Range
inequality	$-\infty < x < \infty,\ x \neq n\pi$, where n is an integer	$-\infty < y \leq -1$ or $1 \leq y < \infty$
interval	$(-\infty, \infty)$, except $n\pi$, where n is an integer	$(-\infty, -1] \cup [1, \infty)$



DOMAIN & RANGE

Function	Domain	Range
$y = \sin x$	$(-\infty, \infty)$	$[-1, 1]$
$y = \cos x$	$(-\infty, \infty)$	$[-1, 1]$
$y = \tan x$	$(-\infty, \infty)$, except $\frac{\pi}{2} + n\pi$, where n is an integer	$(-\infty, \infty)$
$y = \cot x$	$(-\infty, \infty)$, except $n\pi$, where n is an integer	$(-\infty, \infty)$
$y = \csc x$	$(-\infty, \infty)$, except $n\pi$, where n is an integer	$(-\infty, -1] \cup [1, \infty)$
$y = \sec x$	$(-\infty, \infty)$, except $\frac{\pi}{2} + n\pi$, where n is an integer	$(-\infty, -1] \cup [1, \infty)$

EVEN or ODD??

Do you remember the difference??

It has to do with symmetry . . .

EVEN or ODD??

An EVEN symmetry function has "fold" symmetry across the y-axis.

An ODD symmetry function has "rotation" symmetry around the origin.

EVEN or ODD??

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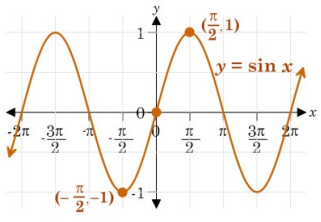
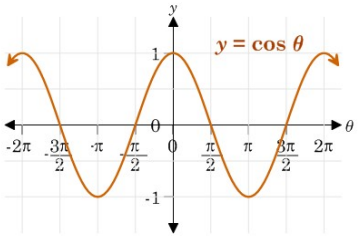
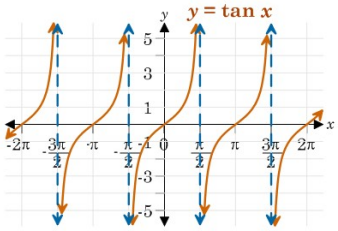
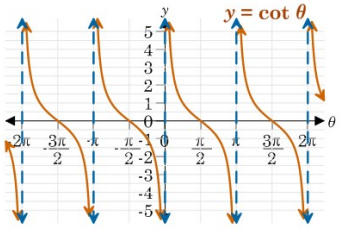
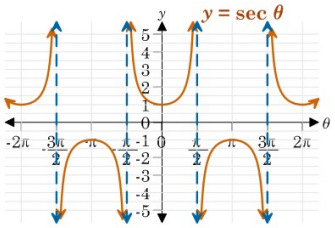


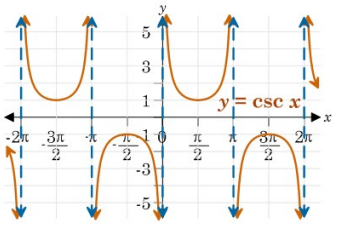


EVEN or ODD??









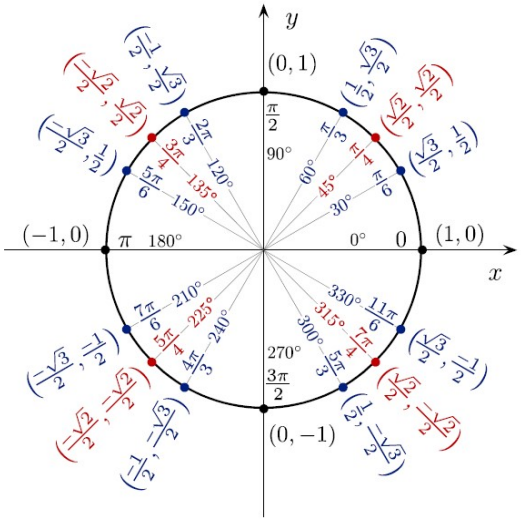
EVEN or ODD??

An EVEN symmetry function has "fold" symmetry across the y-axis.

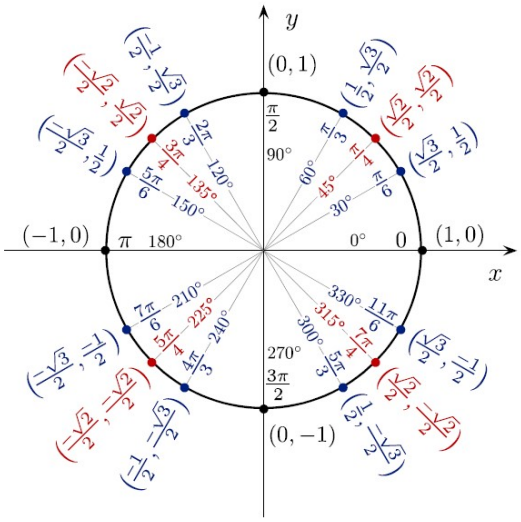
An ODD symmetry function has "rotation" symmetry around the origin.

EVEN:
Cosine & Secant
ODD:
Sine & Cosecant
Tangent & Cotangent

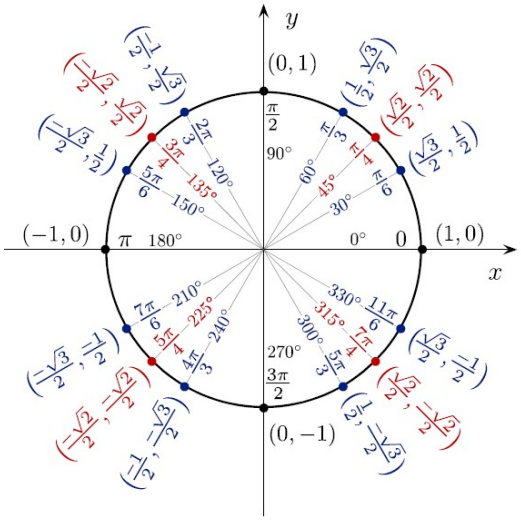
Back to the UNIT CIRCLE:



Have you noticed, that the "opposite" side is always the y-coordinate?!

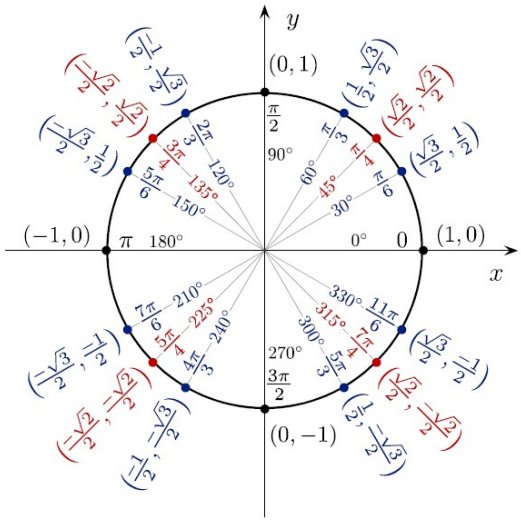


And that the "adjacent" side is always the x-coordinate?!



Check these: sin π/6 = 1/2, and cos π/6 = √3/2

(x, y) = (cos, sin) For the Unit Circle!



SOH-CAH-TOA
on the Unit Circle

That means sin = opp/hyp

becomes **sin = y**

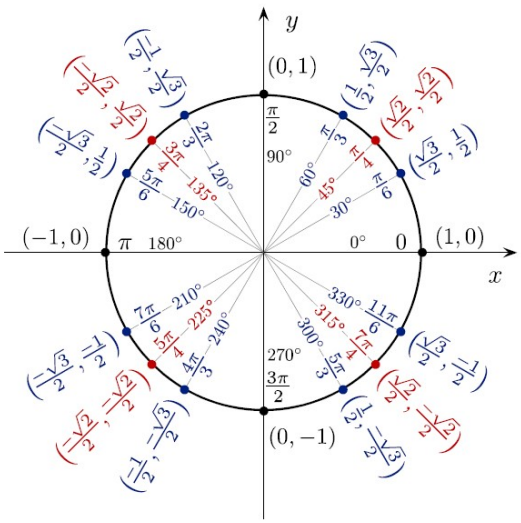
And then cos = adj/hyp

becomes **cos = x**

And so tan = opp/adj

becomes **tan = y/x**

So, look at sine at the axes . . .



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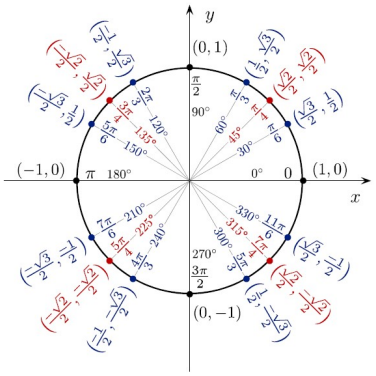


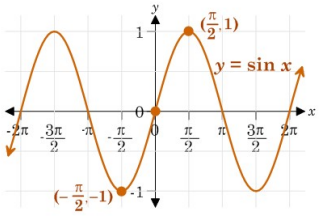
At 0 radians, sin = 0

At π/2 radians, sin = 1

At π radians, sin = 0

At 3π/2 radians, sin = -1

Just as we saw on its graph!



Questions??

Review the Key Terms and Key Concepts documents for this unit.

Look up the topic at khanacademy.org and virtualnerd.com

Check our class website at nca-patterson.weebly.com

***Reserve a time for a call with me at jpattersonmath.youcanbook.me**

We can use the LiveLesson whiteboard to go over problems together!