## Analytic Trigonometry Unit 04 Readings:

## Transforming Trig Functions and More Trig Stuff

The trig graphs are "**functions**" - they have only one "y" value for each "x" value

"**Natural**" trig functions have not been transformed

**Descriptors for the natural trig functions:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Max x** | **Min x** | **Max y** | **Min y** | **Period (rad)** | **Period (degrees)** |
| **sin** | ∞ | -∞ | 1 | -1 | 2π | 360° |
| **cos** | ∞ | -∞ | 1 | -1 | 2π | 360° |
| **tan** | ∞ | -∞ | ∞ | -∞ | π | 360° |
| **cot** | ∞ | -∞ | ∞ | -∞ | π | 360° |
| **sec** | ∞ | -∞ | ∞ | -∞ | 2π | 360° |
| **csc** | ∞ | -∞ | ∞ | -∞ | 2π | 360° |

**Exact Values of trig Functions**

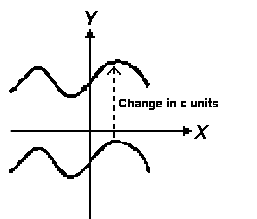
Exact values for trig functions: the real/true EXACT values

Approximate values for trig functions: “close-enough” “good-enough” values that come out of

your calculator

**Exact Values of Sin, Cos and Tan Functions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Deg** | **Rad** | **sin** | **cos** | **tan** |
| 0 | 0 | 0 | 1 | 0 |
| 30 | π/6 | 1/2 | /2 | /3 |
| 45 | π/4 | /2 | /2 | 1 |
| 60 | π/3 | /2 | 1/2 |  |
| 90 | π/2 | 1 | 0 | ∞ |
| 120 | 2π/3 | /2 | –1/2 | – |
| 135 | 3π/4 | /2 | –/2 | –1 |
| 150 | 5π/6 | 1/2 | –/2 | –/3 |
| 180 | π | 0 | –1 | 0 |
| 210 | 7π/6 | –1/2 | –/2 | /3 |
| 225 | 5π/4 | –/2 | –/2 | 1 |
| 240 | 4π/3 | –/2 | –1/2 |  |
| 270 | 3π/2 | –1 | 0 | ∞ |
| 300 | 5π/3 | –/2 | 1/2 | – |
| 315 | 7π/4 | –/2 | /2 | –1 |
| 330 | 11π/6 | –1/2 | /2 | –/3 |
| 360 | 2π | 0 | 1 | 0 |

**Transforming Functions** (algebra review)

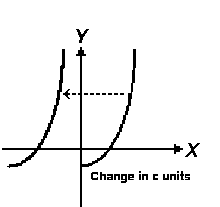
vertical shifts

y = ƒ(*x*) = squiggly line

*g*(*x*) = ƒ(*x*) + c

a positive "c" shifts the curve up

a negative "c" shifts the curve down

horizontal shifts

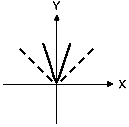
*y* = ƒ(*x*)

*g*(*x*) = ƒ(*x* + c)

a positive "c" shifts the curve left

a negative "c" shifts the curve right

(counter-intuitive)

vertical & horizontal stretching & shrinking

if c>1 *y* = c ƒ(*x*)

stretches vertically

if 0<c<1 *y* = c ƒ(*x*)

shrinks vertically

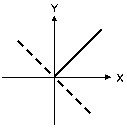
if c>1 *y* = ƒ(c*x*)

shrinks horizontally

(counter-intuitive)

if 0<c<1 *y* = ƒ(c*x*)

stretches horizontally

 (counter-intuitive)

reflection

*y* =  ƒ(*x*)

reflects about the *x*-axis

*y* = ƒ(*x*)

reflects about the *y*-axis

**Transforming Trig Functions**

The general forms of the trig equations are:

y = A sin (Bx - C) + D y = A cos (Bx - C) + D

y = A tan (Bx - C) + D y = A cot (Bx - C) + D

y = A sec (Bx - C) + D y = A csc (Bx - C) + D

The multipliers A, B, C, D allow you to tweak the curves into different shapes

“A” stretches the graph up and down – “Amplitude”

“B” stretches the graph side to side – “Period”

“C” moves the graph side to side – “Phase shift”

“D” moves the graph up and down – “Vertical shift”

Notice the "C" is subtracted - that makes it more intuitive!

Think of "B" as "frequency" - a large number cycles around more frequently

For: y = A sin (Bx - C) + D

y = A cos (Bx - C) + D

amplitude = |A|

period = 2π /B B = period/2π frequency =

phase shift = C/B C = phase shift × period/2*π*

(moves starting point from x = 0 to x = C/B)

vertical shift = D

For: y = A tan (Bx - C) + D

y = A cot (Bx - C) + D

amplitude = |A|

period = π /B B = period/π frequency =

phase shift = C/B C = phase shift× period/π

(moves starting point from x = 0 to x = C/B)

vertical shift = D

For: y = A sec (Bx - C) + D

y = A csc (Bx - C) + D

amplitude = |A|

period = 2π /B B = period/2π frequency =

phase shift = C/B C = phase shift× period/2π

(moves starting point from x = 0 to x = C/B)

vertical shift = D

**Is my function transformed?**

If the tops and bottoms of the sine/cosine curves are at1 and -1, it isa “regular” curve

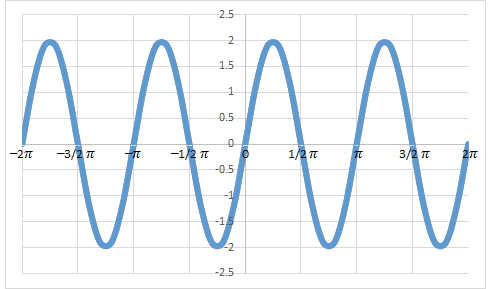
(“A” is 1)

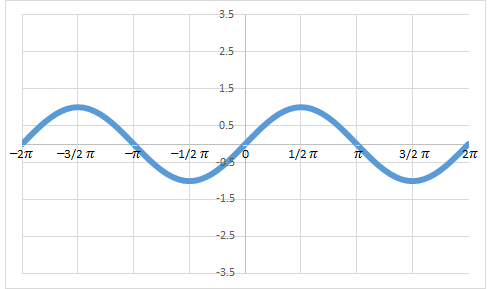
If the inflexion point of a tan/cot curve is at the x-axis, it is a “regular” curve(“A” is 1)

If the tops and bottoms of the “Us” for sec /csc curves are at 1 and -1, it is a “regular” curve

(“A” is 1)

**Which function corresponds with the graph:**

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Which graph is it?

A sine…

Start with the standard sine graph:

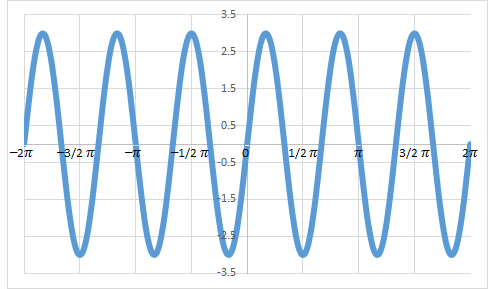
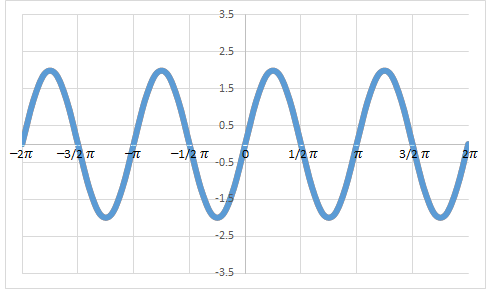
It has amplitude 1

It has a period of 2 𝜋

a) *y* = 2sin (2*x*) b) *y* = 3sin (3*x*):

Twice the frequency

Twice the amplitude



c) *y* = sin (2*x*): d) *y* = 2sin (*x*/2):

