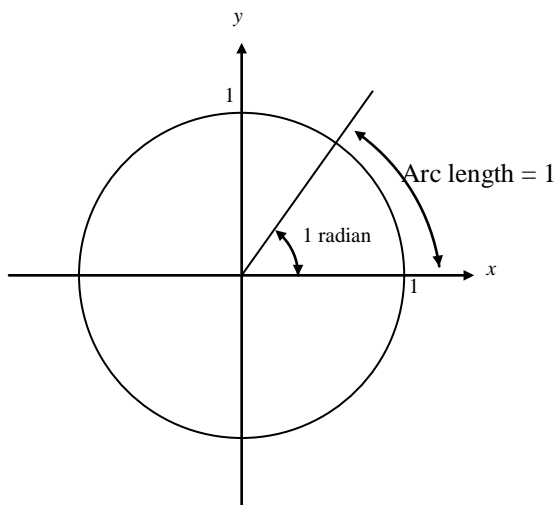


1.6 TRIGONOMETRIC FUNCTIONS

There are two common measures of angles: degrees and radians. As you'll see, almost all of calculus uses radians. Before beginning any exercise with trigonometric functions, make sure your calculator is set in *radian* mode. (ESPECIALLY THOSE YOU WHO HAD PHYSICS YESTERDAY!) Unless otherwise stated, the angles in the text are measured in radians. For example, $\sin 3$ means the sine of 3 radians, but $\sin 3^\circ$ means the sine of 3 degrees. Just for fun, you should understand exactly what a radian is.

Definition: Radian

An angle of **1 radian** is defined to be the angle at the center of a unit circle which spans an arc of length 1, measured counterclockwise.



♫: You should also be VERY familiar with the 6 trigonometric values of the key points on the unit circle $\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}, \dots$

Graphs of Trigonometric Functions

Graph one period of all 6 trigonometric functions below. Label at least 5 points (or asymptotes) for each graph.

$$y = \sin x$$

$$y = \cos x$$

$$y = \tan x$$

$$y = \csc x$$

$$y = \sec x$$

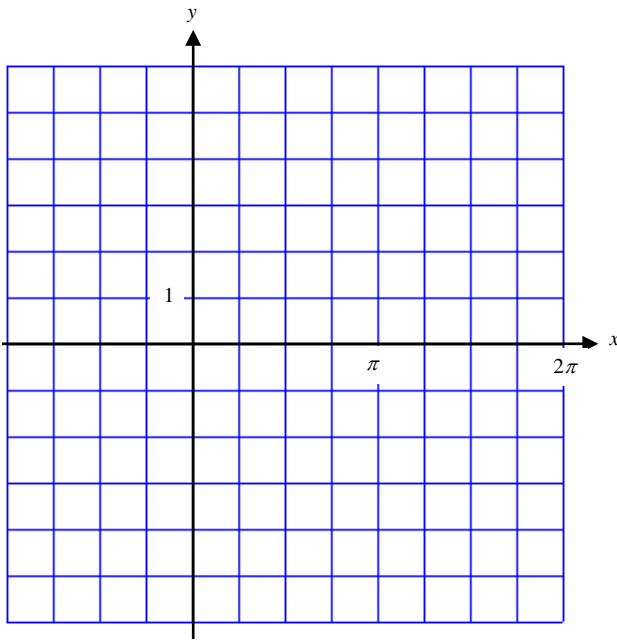
$$y = \cot x$$

Transformations of Trigonometric Functions

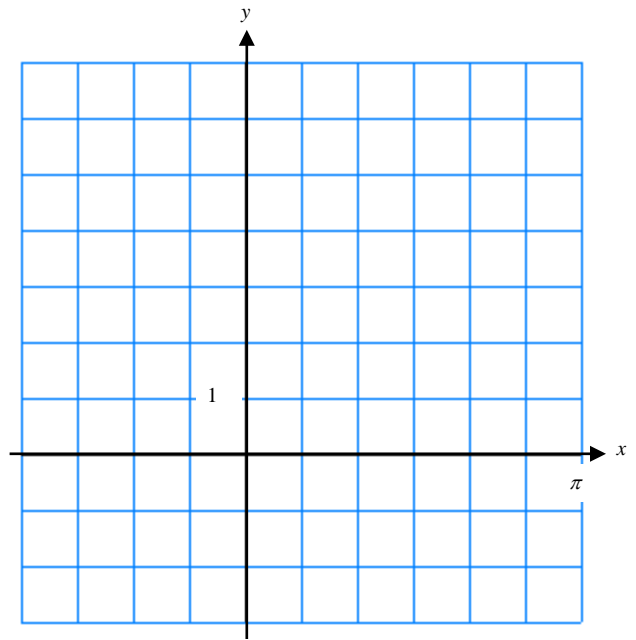
Example: For each of the following examples, do three things.

1. Describe the transformation.
2. Graph the function.
3. Where appropriate, give the amplitude and the period.

a) $y = \sin(-2x + \pi)$



b) $y = -2 \tan(3x - \pi) + 1$



Inverse Trigonometric Functions

Due to the periodic property of trigonometric functions, all 6 of the trig functions fail the horizontal line test. Use the graph of the original function and highlight the portion of the graph used to graph the inverse. Use this highlighted portion to determine the domain and range of each inverse function.

$y = \sin x$

$y = \cos x$

Domain of Inverse:
Range of Inverse:

Domain of Inverse:
Range of Inverse:

$$y = \tan x$$

$$y = \cot x$$

Domain of Inverse: Range of Inverse:

$$y = \csc x$$

Domain of Inverse: Range of Inverse:

$$y = \sec x$$

Domain of Inverse: Range of Inverse:

Domain of Inverse: Range of Inverse:

Check your answers with the information on page 50 and 51 of your textbook. You can also find graphs of the inverse trig functions on these pages as well.

The restricted domain of the inverse trig functions means you must pay close attention to your solutions. Your calculator only gives you the solution for which the domain of the inverse function is defined. Your calculator also only has 3 of the six inverse functions.

Example: Find the domain and range of the following functions:

a) $\sin(\cos^{-1}(x))$

b) $\sec(\tan^{-1}(x))$

Example: Evaluate the expression WITHOUT a calculator. $\tan\left(\sin^{-1}\left(\frac{12}{13}\right)\right)$

Example: Solve for x : $\sec x = 3$ where $0 \leq x \leq 2\pi$.