5.2 Trig Functions: Unit Circle Approach

Unit Circle - radius of 1; center at origin; circumference = 2π

Let $t \geq 0$ be any real # and s be the distance from (1,0) beginning of circle to t. Wrap that distance around arc in counterclockwise rotation to get p (x,y).

If $t < 0$ still begin at pt. (1,0) travel $s = |t|$ units in clockwise direction. See figure 20b on pg. 383.

So, for amy real # t we can locate a unique point (x,y) on the unit circle. We call p "the point on the unit circle that corresponds to t". We use p coordinates on the unit circle to define trig functions for t.

Sine function: $\sin t = y$	Cosine: $\cos t = x$	Tangent: $\tan t = y/x$
Cosecant: $\csc t = 1/y$	Secant: $\sec t = 1/x$	Cotangent: $\cot = x/y$

If an angle is measured in degrees, use the degree symbol when writing trig functions (sin 30 , tan 45).

If an angle is measured in radians, then no symbol is used when writing trig functions (cos π, sec π/3)

Since π/2 radians = 90 p = (0,1)
∴ sin π/2 = sin 90 = 1 and cos π/2 = cos 90 = 0

Ex. 2 Finding exact values of trig functions of quadrantal angles (terminal side on x or y axis).

a) = 0 = 0 p = (1,0)

b) = π/2 = 90 p = (0,1)

Look at chart pg. 387 table 2

Finding exact values of trig functions of $\pi/4 = 45$

notice that p lies on the line y = x, since 45 is 1/2 of 90 ...it bisects quadrant I. Since p = (x,y) also lies on the unit circle, $x^2+y^2= 1$

Ex. 3 Find exact values

a) sin 45 cos 180

b) $(\sec \pi/4)^2+ \csc \pi/2$

Trig functions of $\pi/6 = 30$ and $\pi/3 = 60$

Ex. 4 Find

a) sin π/3 b) csc 60 c) tan π/3

d) cos π/6 e) tan 30

Exact values of multiples of π/6, π/4, π/3 30 , 60 , 90

- we know π/4 = 45 p =

multiples of π/6 multiples of π/3

Use calculator to find trig values (should have sin, cos, tan keys)

sec = 1/x = 1/cos csc = 1/y = 1/sin cot = x/y = 1/tan

Ex. 5 Find and round to 2 decimal places

a) cos 48 b) csc 21 c) tan π/12

Using a circle of radius r to evaluate trig functions (not a unit circle)

this changes the equations to:

sin = y/r	cos = x/r	tan = y/x
csc = r/y	sec = r/x	cot = x/y

Ex. Find exact trig values of angle if (4, -3) is a point on its terminal side.