Math 1210-3
Friday Jan 25

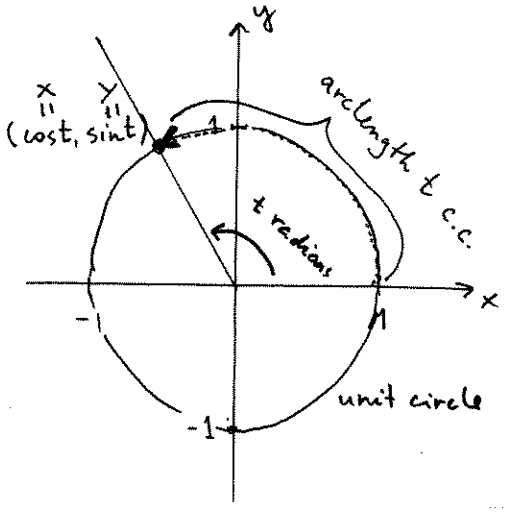
§0.7 Trigonometry.

- First – carefully go through Exercise 5 in Wednesday's notes. This is an excellent summary of most of the possible topics in today's quiz.

Then, ... trig!

The general definition of cost and sint:

Start at (1,0) on the unit-radius circle centered at the origin ("unit circle"). Traverse t units of arclength around the circle, in the counter-clockwise direction. (So if $t<0$, you go clockwise!) The horizontal ("x") coordinate of the resulting point is cost. The vertical, y-coord. is sint.



These arclength units t are called radians. Since the perimeter of the unit circle is 2π, we deduce

2π radians $= 360^\circ$

π rad $= 180^\circ$

Also, $\tan t = \frac{\sin t}{\cos t}$

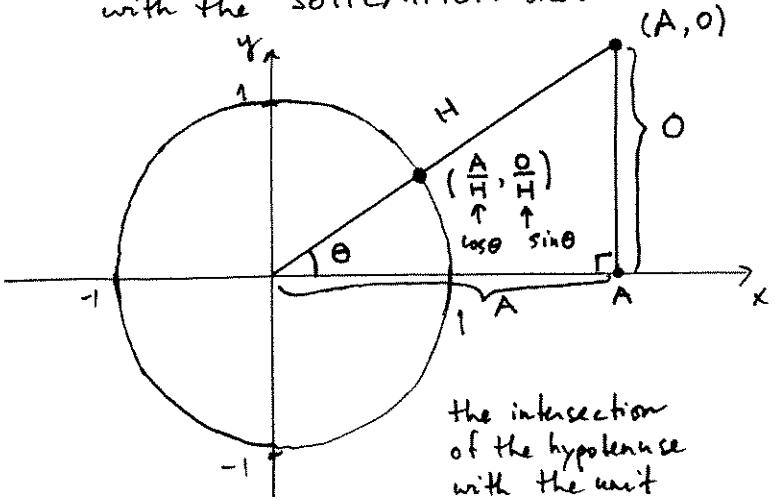
$\sec t = \frac{1}{\cos t}$

$\cot t = \frac{\cos t}{\sin t}$

$\csc t = \frac{1}{\sin t}$

Relation to SOHCAHTOA

If $0<t<\pi/2$ is the radian angle measure, then the angle is acute, and you may have labeled it with θ degrees, $0<\theta<\pi/2$. Then the unit circle picture is consistent with the SOHCAHTOA one:

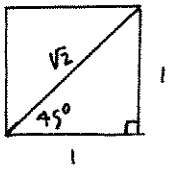


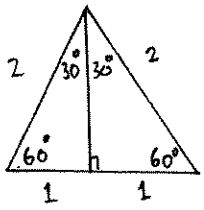
the intersection of the hypotenuse with the unit circle is

$x = \frac{A}{H} = \cos\theta$

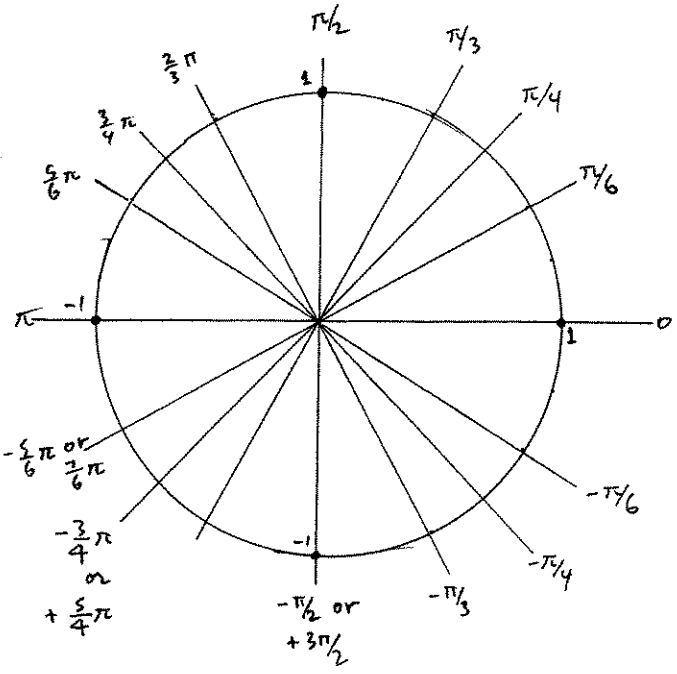
$y = \frac{O}{H} = \sin\theta$.

Exercise 1 Fill in enough of the table below so that you know you could deduce each entry. Use SOHCAHTOA ideas, reflections across x & y axes (and through the origin), and the fact that π rad = 180°. (see also p. 42 of text).





t rad	θ deg	cos t	sin t	tan t	sec t
0	0	1	0	0	1
	45°				
	30°				
$\pi/2$					
	60°				
$3\pi/4$					
$5\pi/6$					
$-\pi/4$					
$-\pi/3$					
33π					
$(-15.5)\pi$					



trig identities pages 47-48.

There are 3 you should memorize, because all the others are consequences of these.

(1) $\sin^2 t + \cos^2 t = 1$ Pythagorean Theorem!

(2) $\sin(\alpha+\beta) = (\sin\alpha)(\cos\beta) + (\cos\alpha)(\sin\beta)$

(3) $\cos(\alpha+\beta) = (\cos\alpha)(\cos\beta) - (\sin\alpha)(\sin\beta)$

} angle addition formulas - we'll see why these are true next week

Exercise 2: I have sketched graphs of $y = \cos x$ and $y = \sin x$. (Notice horiz & vert axes are scaled differently)

(a) Explain why the graphs look the way they do.
Why are they "periodic", with period $= 2\pi$?
Discuss "even" and "odd" properties.

(b) It appears the graph $y = \sin x$ is the graph of $y = \cos x$, translated to the right by $\pi/2$. Check this by expanding $\cos(x - \pi/2)$, using (3)

(c) Add the graph of $y = 3\cos(\frac{1}{2}(x))$ to the picture below: