MA110 #30. 11/2/16.

- MathExcel for MA113
- If you are using an iClicker RF remote, see me.
- Vote.
- www.math.uky.edu/mathexcel

More trig functions—

$\sin(x)$, $\cos(x)$

$\tan(x) = \frac{\sin(x)}{\cos(x)}$.

$\sec(x) = \frac{1}{\cos(x)}$

Secant

$\csc(x) = \frac{1}{\sin(x)}$.

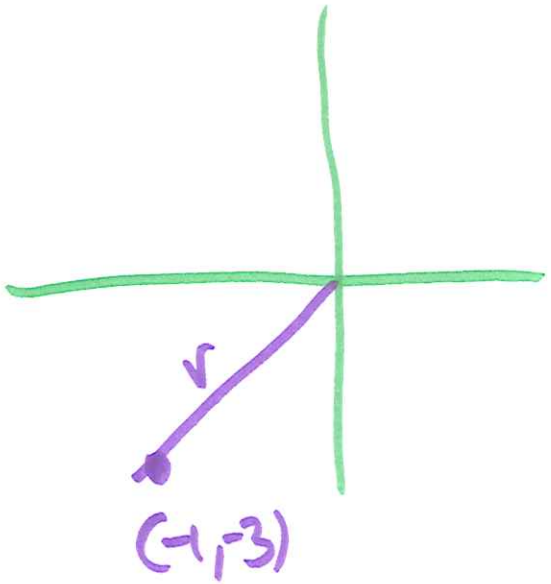
cosecant

$\cot(x) = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)}$.

Like Angle of measurement. Angle is in standard position. Terminal side contains $(-1, -3)$. Find all 6 trig functions.

r = dist. to origin

$= \sqrt{3^2+1^2} = \sqrt{10}$



$$\csc(t) = \frac{1}{\sin(t)} = \frac{-\sqrt{10}}{3}$$

$$\sec(t) = -\sqrt{10}.$$

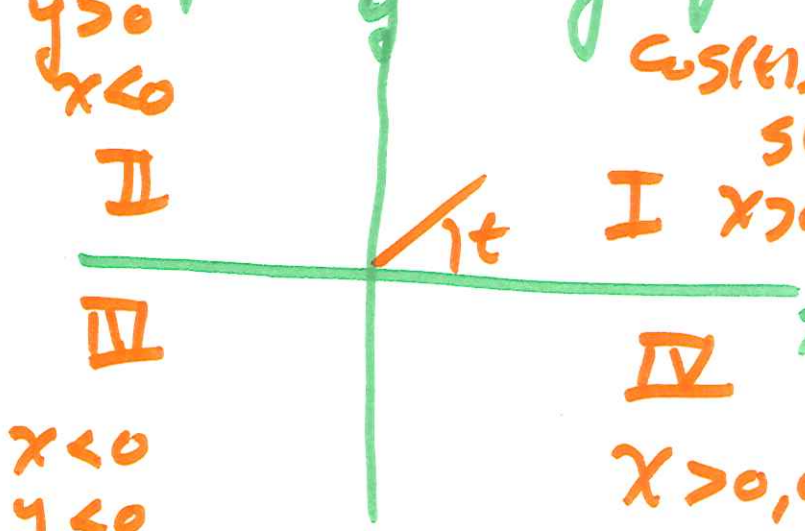
$$\cos(t) = \frac{x}{r} = \frac{-1}{\sqrt{10}} = \frac{-\sqrt{10}}{10}$$

$$\sin(t) = \frac{y}{r} = \frac{-3}{\sqrt{10}} = \frac{-3\sqrt{10}}{10}.$$

$$\tan(t) = \frac{y}{x} = \frac{-3}{-1} = +3$$

$$\cot(t) = \frac{1}{\tan(t)} = \frac{1}{3}$$

Signs of trig functions.



II: $y>0$, $x<0$

III: $x<0$, $y<0$, $\sin(t)<0$, $\cos(t)<0$, $\tan(t)>0$

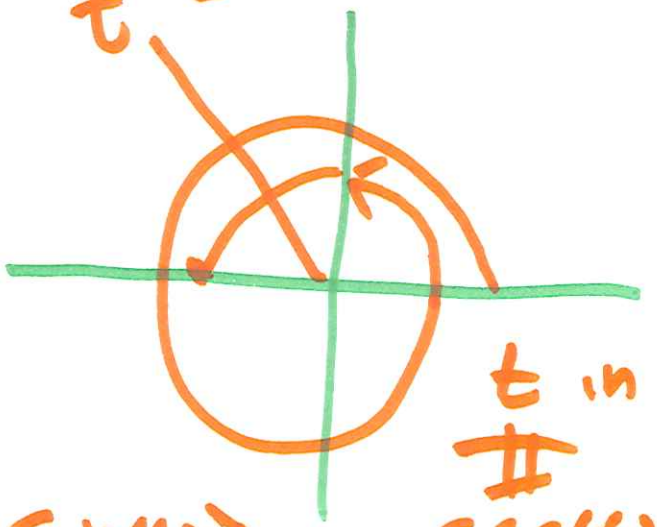
I: $\tan(t)>0$, $\cos(t)>0$, $\sin(t)>0$, $x>0, y>0$

IV: $x>0, y<0$, $\cos(t)>0$, $\sin(t)<0$, $\tan(t)<0$

Which functions are positive if $\frac{5\pi}{2} < t < 3\pi$

$2\pi + \frac{\pi}{2} < t < 2\pi + \pi$

$t =$



t in Quadrant II

$\sin(t) > 0$ $\quad \csc(t) > 0$

$\cos(t) < 0$ $\quad \sec(t) < 0$

$\cot(t) < 0$ $\quad \tan(t) < 0$

REF.

$\cos(t)$ is < 0 $\quad x < 0$

$\tan(t) = \frac{\sin(t)}{\cos(t)}$, is > 0

$x < 0$ + $\frac{y}{x} > 0$

gives y is < 0

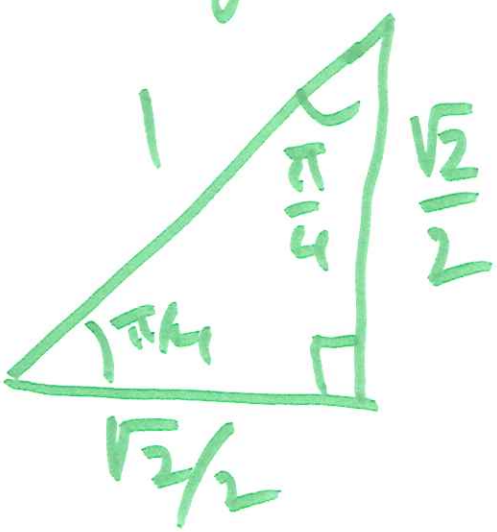
$x < 0$, $y < 0$, Quadrant III

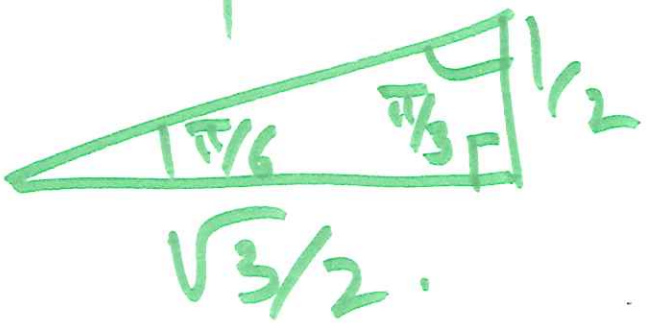
$\pi < t < \frac{3\pi}{2}$.

$\pi + 2\pi < t < \frac{3\pi}{2} + 2\pi$

$\vdots$

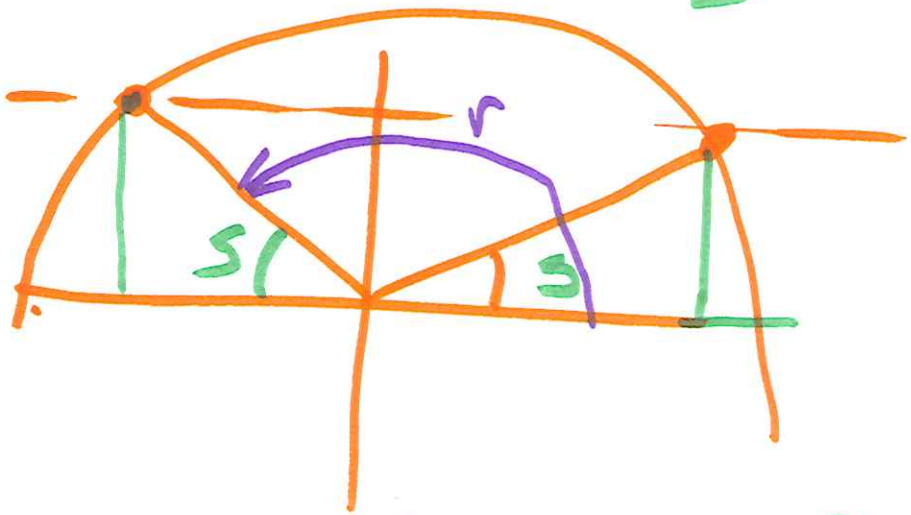
Recall special triangles.





Solve

$\sin(\pi t) = \frac{1}{2}$, $0 < t < 2$.



$\sin(s) = 1/2$ if $s = \pi/6$

$\sin(r) = \frac{1}{2}$ if $r = \pi/6$

$\pi t = \pi/6$, then $t = \underline{1/6}$.

$\pi t = 5\pi/6$, then $t = \underline{5/6}$

REEF #3.

Solve $\tan(2x) = 1$.

w/ $0 < x < \pi$.

Recall $\tan(x)$ has period π, so $\tan(2x)$ has period $\pi/2$.

~~tan~~ $\tan(5) = 1$ ✓

$5 = \frac{\pi}{4}, \frac{\pi}{4}+\pi, \frac{\pi}{4}+2\pi$

$2x = \pi/4, \; x = \pi/8$

$2x = 5\pi/4, \; x = 5\pi/8$

Identities.

Definitions

$\tan(t) = \frac{\sin(t)}{\cos(t)}$

$\cot(t) = \frac{\cos(t)}{\sin(t)} = \frac{1}{\tan(t)}$.

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

$\csc(t) = \frac{1}{\sin(t)}$.

Pythagorean identities

$\cos^2(t) + \sin^2(t) = 1$.

Since $(\cos(t), \sin(t))$ is a point on the unit circle.

$1 + \tan^2(x)$.

$= 1 + \dfrac{\sin^2(x)}{\cos^2(x)}$.

$= \dfrac{\cos^2(x) + \sin^2(x)}{\cos^2(x)}$

$= \dfrac{1}{\cos^2(x)} = \sec^2(x)$.

$1 + \tan^2(x) = \sec^2(x)$.

$1 + \cot^2(x) = \csc^2(x)$.

Simplify

$\tan(t) \cdot \cot(t)$

$= \dfrac{\sin(t)}{\cos(t)} \cdot \dfrac{\cos(t)}{\sin(t)}$

$= 1$.