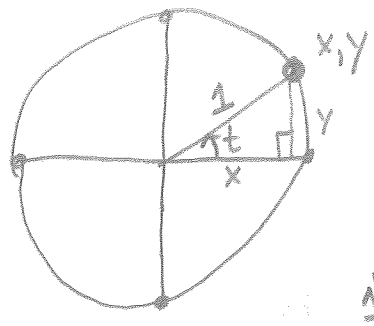
Section 5.2: Trig Functions of Real Numbers

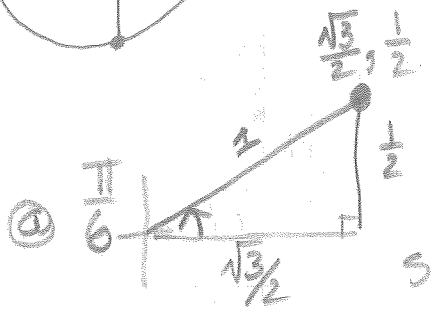


The hypotenuse = 1 on the unit circle

so... $\sin t = y$ $\csc t = 1/y$

$\cos t = x$ $\sec t = 1/x$

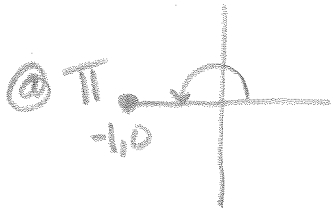
$\tan t = y/x$ $\cot t = x/y$



$\sin\frac{\pi}{6} = \frac{1}{2}$ $\csc\frac{\pi}{6} = 2$

$\cos\frac{\pi}{6} = \sqrt{3}/2$ $\sec\frac{\pi}{6} = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\tan\pi/6 = \frac{1/2}{\sqrt{3}/2} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\cot\frac{\pi}{6} = \sqrt{3}$



$\sin\pi = 0$ $\csc\pi = 1/0 \rightarrow$ undefined

$\cos\pi = -1$ $\sec\pi = 1/-1 = -1$

$\tan\pi = 0/1 = 0$ $\cot\pi = -1/0 =$ und.

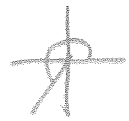
t	sin t	cos t
0°, 0	$\sqrt{0}/2$ (0)	$\sqrt{4}/2$ (1)
30°, $\frac{\pi}{6}$	$\sqrt{1}/2$ ($\frac{1}{2}$)	$\sqrt{3}/2$
45°, $\frac{\pi}{4}$	$\sqrt{2}/2$	$\sqrt{2}/2$
60° $\frac{\pi}{3}$	$\sqrt{3}/2$	$\sqrt{1}/2$ ($\frac{1}{2}$)
90° $\frac{\pi}{2}$	$\sqrt{4}/2$ (1)	$\sqrt{0}/2$ (0)

rem: tan = sin/cos

	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π
sin t	0	1/2	$\sqrt{2}/2$	$\sqrt{3}/2$	1	0
cos t	1	$\sqrt{3}/2$	$\sqrt{2}/2$	1/2	0	-1
tan t	0	$\sqrt{3}/3$	1	$\sqrt{3}$	u	0

sin & csc	All
tan & cot	cos & sec

$\sin\frac{5\pi}{4} = -\sin\frac{\pi}{4} = -\frac{\sqrt{2}}{2}$

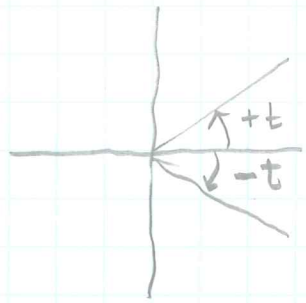


even-odd Properties

$\sin(-t) = -\sin t$

$\cos(-t) = \cos t$

$\tan(-t) = -\tan t$



$\csc(-t) = -\csc$

$\sec(-t) = \sec t$

$\cot(-t) = -\cot t$

Reciprocal Identities

$\sin t = \frac{1}{\csc t}$ $\quad \csc t = \frac{1}{\sin t}$ $\quad \tan t = \frac{\sin t}{\cos t}$

$\cos t = \frac{1}{\sec t}$ $\quad \sec t = \frac{1}{\cos t}$ $\quad \cot t = \frac{\cos t}{\sin t}$

$\tan t = \frac{1}{\cot t}$ $\quad \cot t = \frac{1}{\tan t}$

Pythagorean Identities $(\sin t)^2 = \sin^2 t$

$\sin^2 t + \cos^2 t = 1 \rightarrow \div \sin^2 t \rightarrow 1 + \cot^2 t = \csc^2 t$

- $\sin^2 t = 1 - \cos^2 t$

  $\sin t = \pm\sqrt{1-\cos^2 t}$

$\div \cos^2 t \rightarrow \tan^2 + 1 = \sec^2 t$

- $\cos^2 t = 1 - \sin^2 t$

  $\cos t = \pm\sqrt{1-\sin^2 t}$

- Find all the trig Functions

$\cos t = \frac{5}{13}$ $\quad$ use $\cos^2 t + \sin^2 t = 1$

$\sin t = \frac{12}{13}$ $\quad \frac{25}{169} + \frac{(144)}{169} = \frac{169}{169}$

- write $\tan t$ in terms of $\sin t$ in III

$\tan t = \frac{\overset{\ominus}{\sin t}}{\underset{\ominus}{\cos t}} = \frac{\overset{\ominus}{\sin t}}{\underset{\uparrow}{-}\sqrt{1-\sin^2 t}}$ $\quad \oplus$