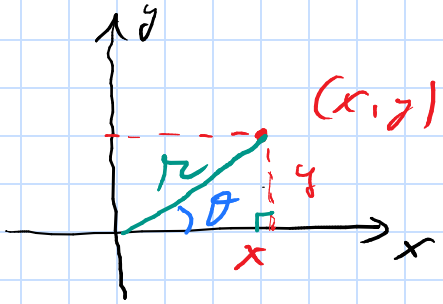
Pre-Cal (10/1)

$r = \sqrt{x^2 + y^2}$

hyp: largest side.



$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$ $\tan\theta = \frac{y}{x}$

$\csc\theta = \frac{r}{y}$ $\sec\theta = \frac{r}{x}$ $\cot\theta = \frac{x}{y}$

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

$\cos\theta = \frac{1}{\sec\theta}$; $\tan\theta = \frac{1}{\cot\theta}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$; $\cot\theta = \frac{\cos\theta}{\sin\theta}$

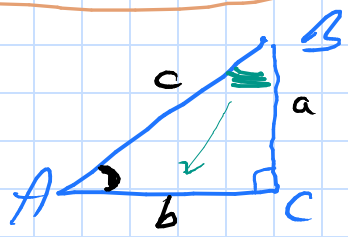
Ex ~~Given~~ $(8, 15) \longrightarrow 17$ θ

$\sin\theta = \frac{15}{17}$ $\cos\theta = \frac{8}{17}$ $\tan\theta = \frac{15}{8}$

$\csc\theta = \frac{17}{15}$ $\sec\theta = \frac{17}{8}$ $\cot\theta = \frac{8}{15}$

$\sin A = \frac{a}{c}$ $\cos A = \frac{b}{c}$ $\tan A = \frac{a}{b}$

$\csc A = \frac{c}{a}$ $\sec A = \frac{c}{b}$ $\cot A = \frac{b}{a}$



$\sin B = \frac{b}{c}$ $\cos B = \frac{a}{c}$ $\tan B = \frac{b}{a}$

$\csc B = \frac{c}{b}$ $\sec B = \frac{c}{a}$ $\cot B = \frac{a}{b}$

#7 $(16,-12) = 4(4,-3) \longrightarrow 5$

$\sin\theta = -\frac{3}{5}$ $\cos\theta = \frac{4}{5}$ $\tan\theta = -\frac{3}{4}$

$\csc\theta = -\frac{5}{3}$ $\sec\theta = \frac{5}{4}$ $\cot\theta = -\frac{4}{3}$

Ex $\cos\theta = \frac{\sqrt{3}}{2}$ $\theta \in$ IV $\sin\theta$, $\tan\theta$

59 → 1 ← 59. minus

$\sin\theta = -\frac{1}{2}$

$\tan\theta = -\frac{1}{\sqrt{3}}$

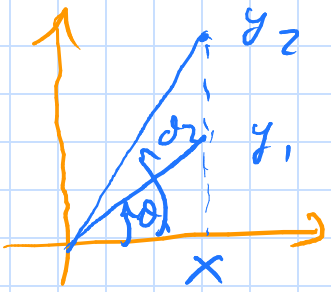
#30 $\cos\theta = -\frac{12}{13}$ θ QIII $(-12,-5) \longrightarrow 13$

$\sin\theta = -\frac{5}{13}$ $\cos\theta = -\frac{12}{13}$ $\tan\theta = \frac{5}{12}$

$\csc\theta = -\frac{13}{5}$ $\sec\theta = -\frac{13}{12}$ $\cot\theta = \frac{12}{5}$

$\tan\theta_1 = \frac{y_1}{x}$

$\tan\theta_2 = \frac{y_2}{x}$ ↗



as y increases tangent increases

No limit for y $\therefore \tan\theta = \infty$

$x^2 + y^2 = r^2$

$r^2\cos^2\theta + r^2\sin^2\theta = r^2$

$\cos^2\theta + \sin^2\theta = 1$

$\cos\theta = \frac{x}{r}$, $\sin\theta = \frac{y}{r}$

$x = r\cos\theta$, $y = r\sin\theta$

Polar

$r \neq 0$

$(\cos\theta)^2 = \cos^2\theta$

$\cos\theta^2 \neq \cos(\theta^2)$ $\cos x^2$

$\cos 2\theta$ ↳ Cosine double angle $= \cos(2\theta)$

$\frac{\cos^2\theta}{\cos^2\theta} + \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$

$1 + \tan^2\theta = \sec^2\theta$

$\frac{\cos^2\theta}{\sin^2\theta} + \frac{\sin^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

$\cot^2\theta + 1 = \csc^2\theta$

$\cos^2\theta + \sin^2\theta = 1$

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

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

$x^2 + y^2 = r^2$ $\Big\}$ $x^2 = r^2 - y^2$, $y^2 = r^2 - x^2$

$x = \pm\sqrt{r^2 - y^2}$ $\quad y = \pm\sqrt{r^2 - x^2}$

$\sqrt{x^2+9}$ $\quad x \to 3\tan\theta$

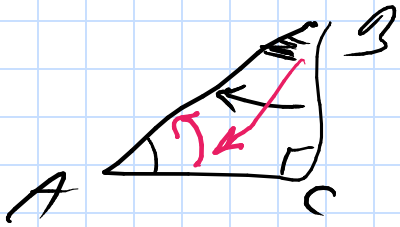
$\sqrt{x^2+9} = \sqrt{9\tan^2\theta + 9}$

$= \sqrt{9(\tan^2\theta + 1)}$

$= 3\sqrt{\sec^2\theta}$

$= 3|\sec\theta|$

$A + B = 90^\circ$



$\sin A = \cos B$

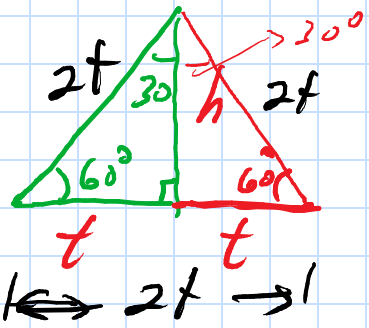
$= \sin(90^\circ - B)$

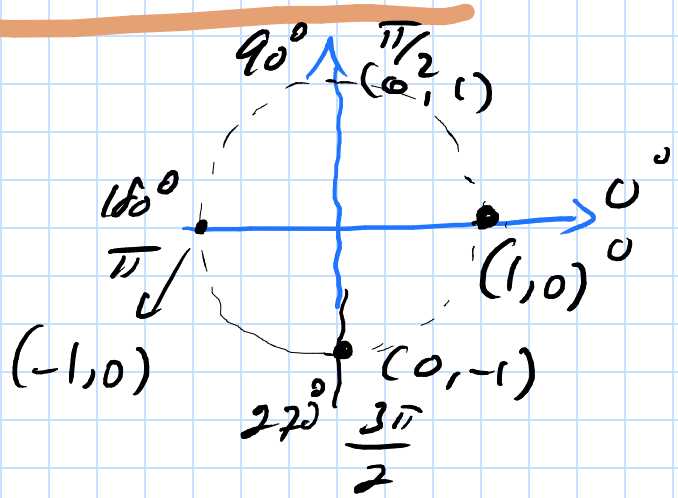
$\cos A = \sin B$

$\sec A = \csc B$

$\tan A = \cot B$

$30^\circ, 60^\circ \to 90^\circ$





$\cos 60^\circ = \frac{t}{2t} = \frac{1}{2} = \sin 30^\circ$

$\sin 60^\circ = \frac{h}{2t}$

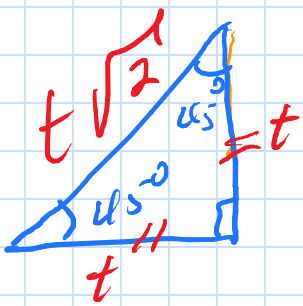
$= \frac{\sqrt{3}\,t}{2t}$

$= \frac{\sqrt{3}}{2} = \cos 30^\circ$

$h^2 + t^2 = (2t)^2$

$h^2 = 4t^2 - t^2$

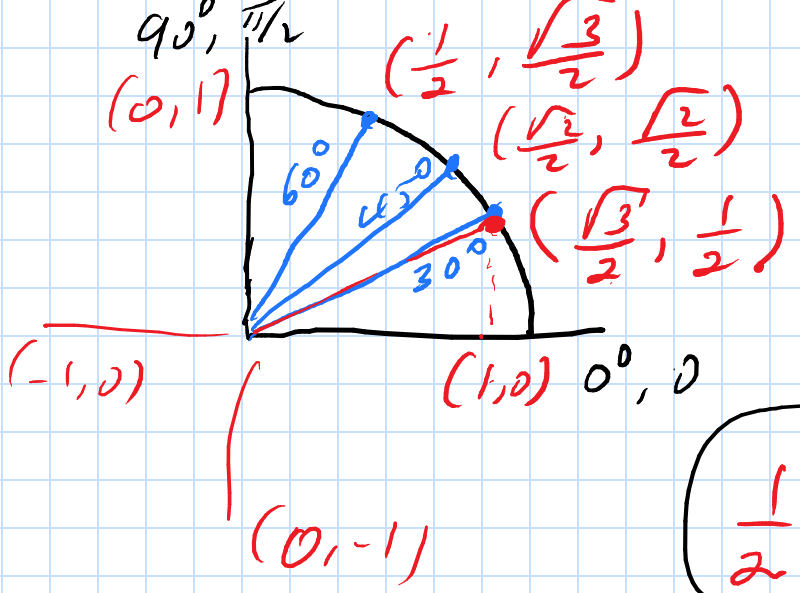
$= 3t^2$



$d = \sqrt{t^2 + t^2} = \sqrt{2t^2} = t\sqrt{2}$

$\cos 45^\circ = \frac{t}{t\sqrt{2}} = \frac{1}{\sqrt{2}} = \sin 45^\circ$

$\frac{\sqrt{2}}{2}$

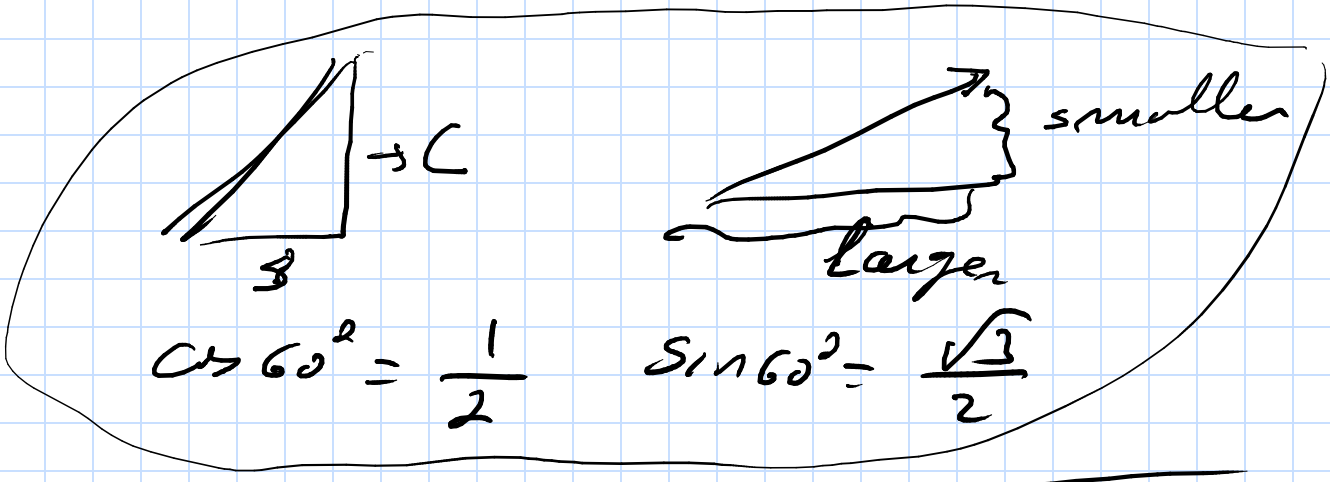


or $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

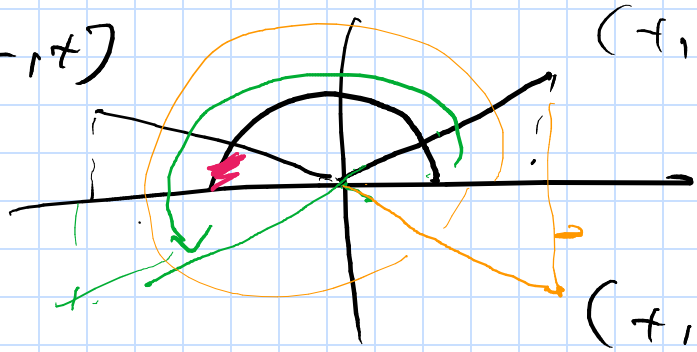
30° or π/6
60° π/3

$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$
		cos⁻¹ or π/4

$\cos 30° = \frac{\sqrt{3}}{2}$ $\quad \sin 30° = \frac{1}{2}$



$\cos 60° = \frac{1}{2}$ $\quad \sin 60° = \frac{\sqrt{3}}{2}$



$180° - \theta$
$\pi - \theta$

$180° + \theta$
$\pi + \theta$

$360° - \theta$
$2\pi - \theta$

Reference angle

θ	I	$\frac{\pi}{6}$	$\frac{\pi}{12}$	I
$\pi - \theta$	II	$\frac{(6-1)\pi}{6}$	$\frac{11\pi}{12}$	II
$\pi + \theta$	III	$\frac{(6+1)\pi}{6}$	$\frac{13\pi}{12}$	III
$2\pi - \theta$	IV	$\frac{(2\cdot 6-1)\pi}{6}$	$\frac{23\pi}{12}$	IV