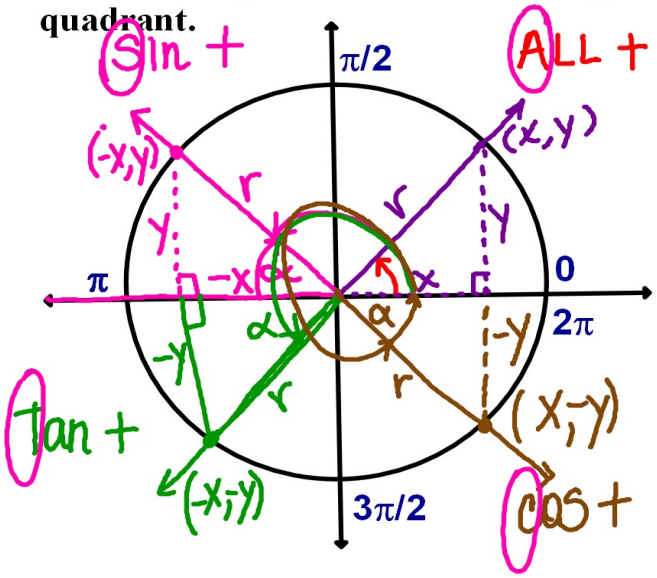
13-3 Trig Functions of Any Angle

To evaluate a trig function of an angle, you need to know the reference angle and whether the trig function is + or - in that quadrant.



ASTC

compare on calculator

Sin 140°
sin 40°
sin 220°
sin 320°

ref ∠ 40°

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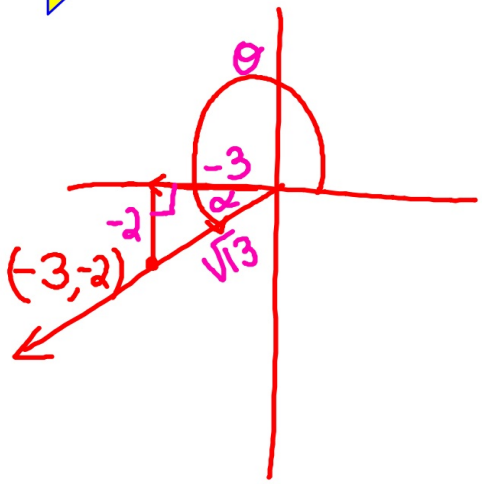
ex. 1 **(-3, -2) is a point on the terminal side of angle θ. Evaluate the six trig functions of θ.**



$\sin\theta = \frac{-2}{\sqrt{13}} = \frac{-2\sqrt{13}}{13}$

$\cos\theta = \frac{-3}{\sqrt{13}} = \frac{-3\sqrt{13}}{13}$

$\tan\theta = \frac{2}{3}$

$\cot\theta = \frac{3}{2}$

$\csc\theta = \frac{\sqrt{13}}{-2}$

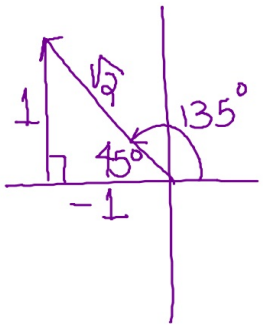
$\sec\theta = \frac{\sqrt{13}}{-3}$

ex. 2 **Evaluate without a calculator.**

cos 135°

$= -\frac{1}{\sqrt{2}}$

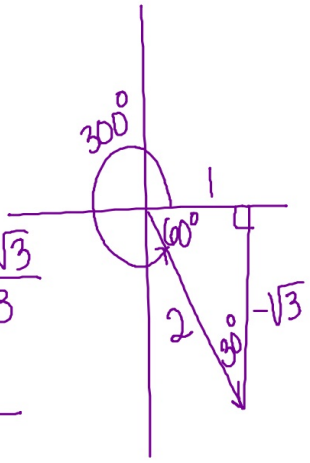
$= -\frac{\sqrt{2}}{2}$



csc 660°

$\frac{-360}{\csc 300^\circ}$

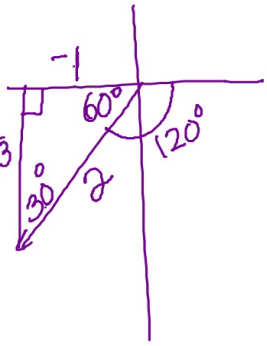
$\frac{2}{-\sqrt{3}} = \frac{-2\sqrt{3}}{3}$



$\cot\left(\frac{-8\pi}{3}\right) \cdot \frac{60}{\pi}$

$\cot(-480^\circ) = \cot(-120^\circ)$

$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$



A *quadrantal angle* has its terminal side on an axis.

$\ldots, -180^\circ, -90^\circ, 0^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ, \ldots$

ex. 3 **Evaluate all 6 trig functions of 270°.**

$\sin 270^\circ = -1$

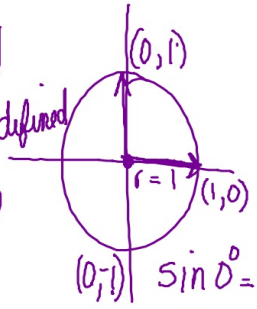
$\cos 270^\circ = 0$

$\tan 270^\circ = \text{undefined}$ $\quad \frac{-1}{0}$

$\csc 270^\circ = -1$

$\sec 270^\circ = \text{undefined}$

$\cot 270^\circ = 0$ $\quad \frac{0}{-1}$



$\sin 0^\circ = \frac{0}{1}$

$\sin 90^\circ = \frac{1}{1} = 1$