A reference angle for an angle whose initial side is on the positive x-axis and terminal side may lie in any of the four quadrants is the positive acute angle between the terminal side of the given angle and the x-axis

$\sin 45°$ $\frac{1}{\sqrt{2}}$

$\tan 60°$ $\sqrt{3}$

$\sec 45°$ $\sqrt{2}$

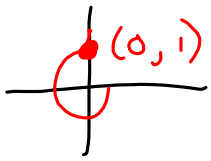
$\csc 30°$ 2

$\csc \frac{3\pi}{2} = -1$

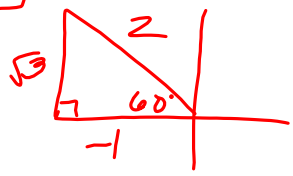
$\frac{1}{\sin\frac{3\pi}{2}} = \frac{1}{-1}$

$\sec(-270°) = \frac{1}{\cos -270}$

$= \frac{1}{0}$ undefined



$\cot(120°)$ $-\frac{1}{\sqrt{3}}$



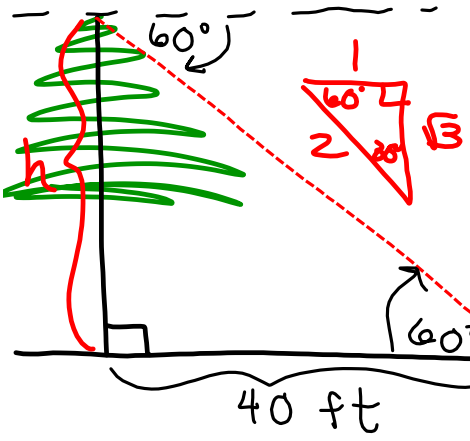
$\csc(-135°)$ $-\sqrt{2}$

$\tan(540°)$

$\frac{-360°}{180°}$

$\frac{0}{1} = 0$

A botanist stands 40 ft. from the base of a tree and estimates the angle of elevation to the tree's peak to be 60 degrees. How tall is the tree?



** Angles of elevation and depression are always measured from the horizontal

$\tan 60° = \frac{h}{40 ft}$

$h = 40 \tan 60°$ ft

$= 40\sqrt{3}$ ft

4. A car travels at 60 miles per hour. Its wheels have a 24 inch diameter. What is the angular speed of a point on the rim of a wheel in revolutions per minute?

$V = 60\ mi/h$; $r = 12\ in$; $\omega = ?\ rev/min$ $\qquad \frac{V}{r} = \frac{r\omega}{r}$

$$\omega = \frac{v}{r} = \frac{v}{1} \cdot \frac{1}{r}$$

$$= \frac{60\ mi}{h} \cdot \frac{1}{12\ in} \cdot \frac{1\ h}{60\ min} \cdot \frac{12\ in}{1\ ft} \cdot \frac{5280\ ft}{1\ mi} \cdot \frac{1\ rev}{2\pi}$$

$$= \frac{2640}{\pi}\ rev/min$$