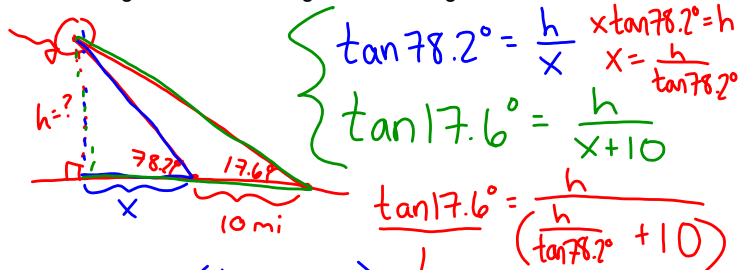


Turn in Homework:

- 5.1 #1, 2, 7 18 all, 31 74 all
- 4 problems on handout
- 5.2 #1-33odd

Make sure each section is neatly labelled, and your name is written clearly on the first page. Staple all pages together neatly at the top left, and place in a stack at the front.

A weather balloon is directly west of two observing stations that are 10 miles apart. The angles of elevation of the balloon from the two stations are 17.6 degrees and 78.2 degrees. How high is the balloon?



$$\left\{ \begin{aligned} \tan 78.2^\circ &= \frac{h}{x} & \times \tan 78.2^\circ &= h \\ & & x &= \frac{h}{\tan 78.2^\circ} \end{aligned} \right.$$

$$\tan 17.6^\circ = \frac{h}{x+10}$$

$$\frac{\tan 17.6^\circ}{1} = \frac{h}{\left(\frac{h}{\tan 78.2^\circ} + 10\right)}$$

$$\tan 17.6^\circ \left(\frac{h}{\tan 78.2^\circ} + 10 \right) = h$$

Let $A = \tan 17.6^\circ$
 $B = \tan 78.2^\circ$

$$A \left(\frac{h}{B} + 10 \right) = h$$

$$\frac{Ah}{B} + 10A = h$$

$$10A = h - \frac{Ah}{B}$$

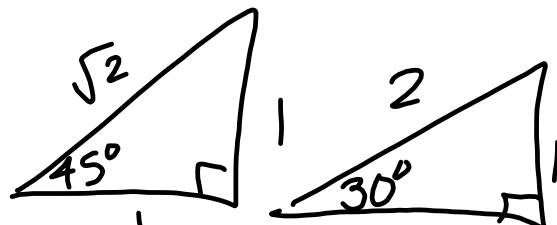
$$10A = h \left(1 - \frac{A}{B} \right)$$

$$\boxed{\frac{10 \tan 17.6^\circ}{1 - \frac{\tan 17.6^\circ}{\tan 78.2^\circ}}} = \frac{10A}{1 - \frac{A}{B}} = h$$

4 handout
 problems
 solutions in
 "General
 course
 notes"

$$\frac{5.2}{\#37} \sin \frac{\pi}{4} + \tan \frac{\pi}{6}$$

$$= \sin 45^\circ + \tan 30^\circ$$



$$\frac{\sqrt{3} + \sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{18} + \sqrt{12}}{6}$$

$$\left(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} \right) \left(\frac{3\sqrt{2} + 2\sqrt{3}}{6} \right)$$

deg. min. sec.
 $32^\circ 4' 53''$

$$1 \text{ min} = \frac{1}{60}^\circ$$

$$1 \text{ sec} = \frac{1}{60}'$$

$$1'' = \frac{1}{3600}^\circ$$

$$32 + \frac{4}{60} + \frac{53}{3600}$$

5.1
72. $r = 14 \text{ in}; v = 55 \text{ mi/h}; \omega = ? \frac{\text{rad}}{\text{s}}$

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

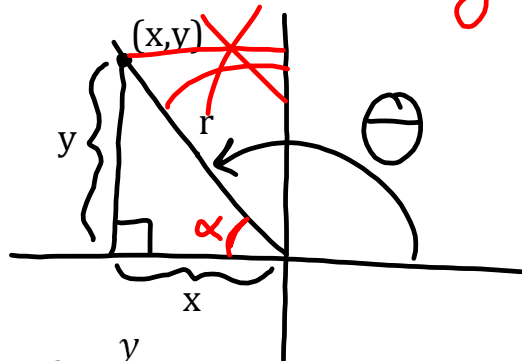
$$\omega = \frac{55 \text{ mi}}{\text{h}} \cdot \frac{1}{14 \text{ in}} \cdot \frac{1 \text{ h}}{3600 \text{ s}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}}$$

$$= \frac{55 \cdot 12 \cdot 5280}{14 \cdot 3600} \approx \frac{\text{rad}}{\text{s}}$$

5.3 - Trigonometric Functions of Any Angle

For an angle in standard position, the reference angle is the acute angle between the terminal side of the angle and the x-axis.

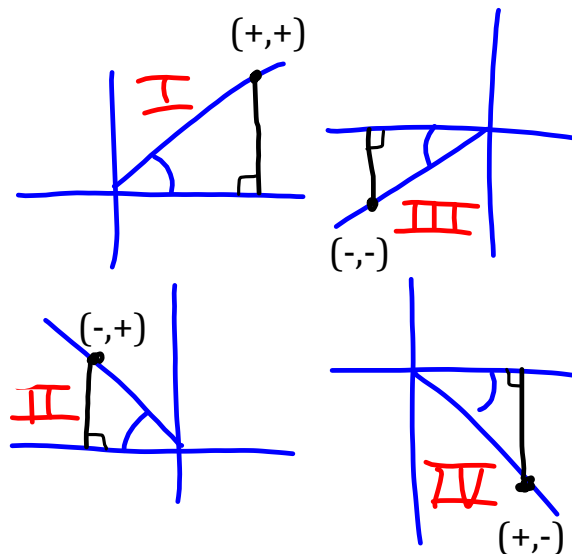
reference triangle



$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

$$\tan \theta = \frac{y}{x}$$

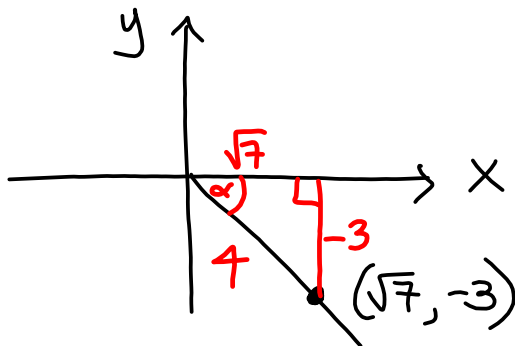


* note that the hypotenuse r is always positive, so that the x - and y -coordinates determine whether the trig function is positive or negative

II S tudents only s ine (and its reciprocal)	I A ll all functions are positive
T ake only t an (and its reciprocal)	C alculus only c osine (and its reciprocal)
III	IV

Tells us which functions are positive in which quadrants.

Find the 6 trigonometric function values of an angle whose terminal side passes through the given point.



$$h^2 = (\sqrt{7})^2 + (-3)^2$$

$$= 7 + 9$$

$$h^2 = 16$$

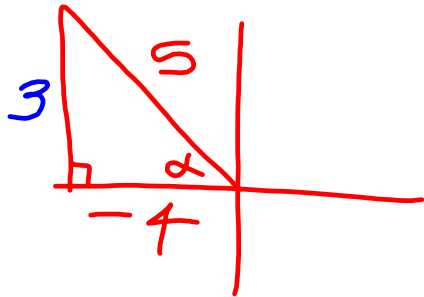
$$h = 4$$

$$\sec \alpha = \frac{4}{\sqrt{7}}$$

$$\tan \alpha = \frac{-3}{\sqrt{7}}$$

$$\sin \alpha = \frac{-3}{4}$$

36. Given that $\cos \alpha = -\frac{4}{5}$ and $\alpha \in QII$,
find the other 5 trigonometric function values of α .



$$\cos \alpha = -4/5$$

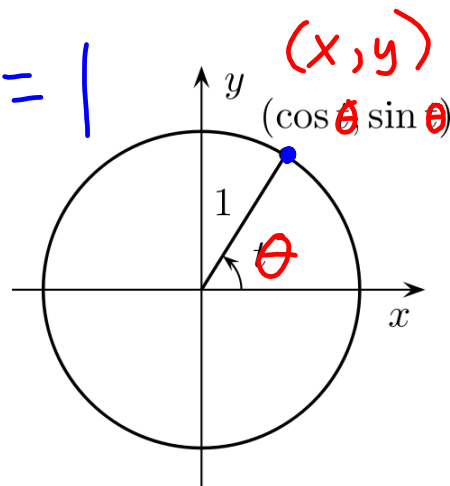
$$\csc \alpha = 5/3$$

$$\cot \alpha = -4/3$$

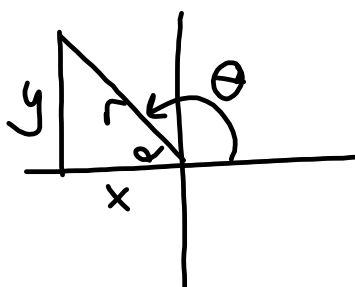
The unit circle and function values of 30°, 45°, and 60° reference angles

unit circle:
radius $r=1$
center $(0,0)$

$$x^2 + y^2 = 1$$



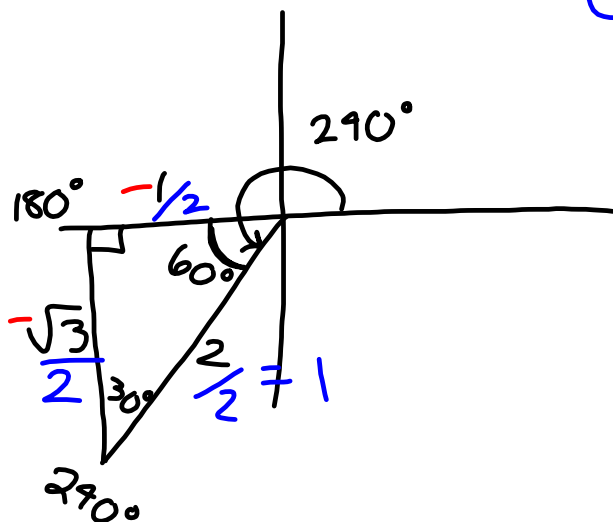
$(x-h)^2 + (y-k)^2 = r^2$
center: (h,k) ; radius: r



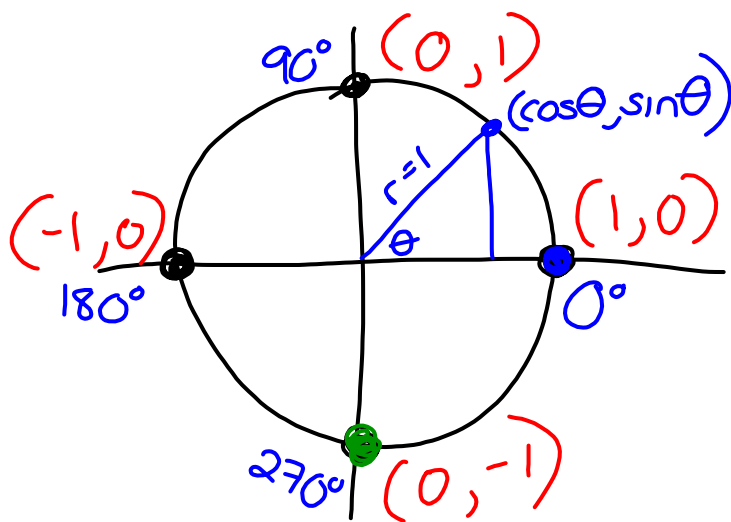
$$\sin \theta = \frac{y}{r} \quad y = r \sin \theta$$

$$\cos \theta = \frac{x}{r} \quad x = r \cos \theta$$

$$\sin 240^\circ = ? = \boxed{-\frac{\sqrt{3}}{2}}$$



What about quadrantal angles?



$$\sec \theta = \frac{1}{\cos \theta}$$

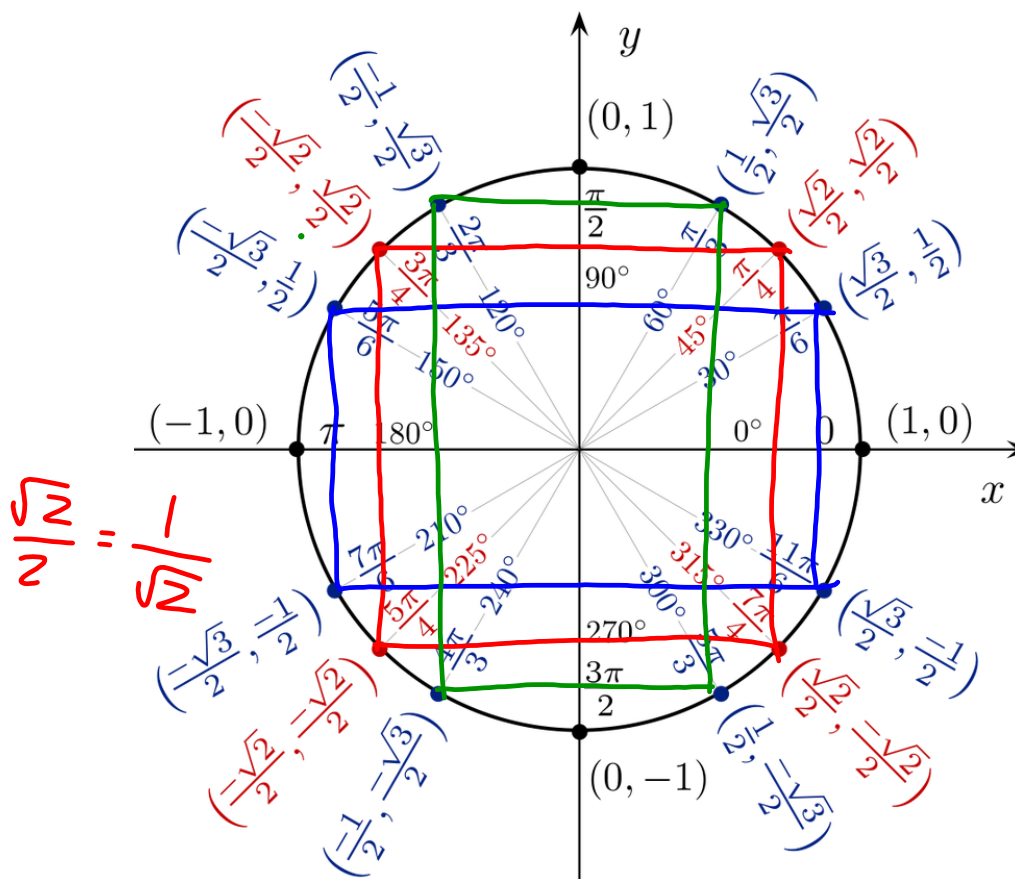
$$\csc \theta = \frac{1}{\sin \theta}$$

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

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

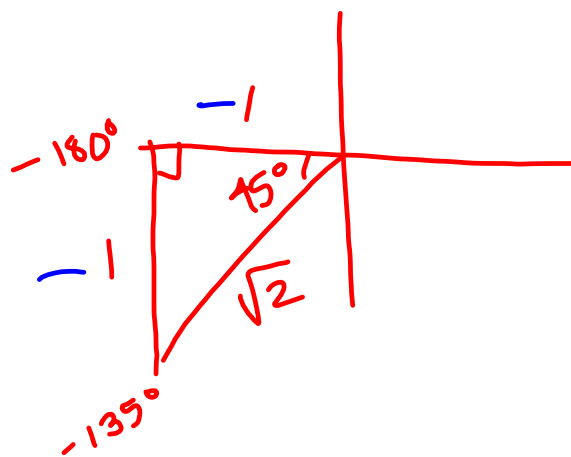
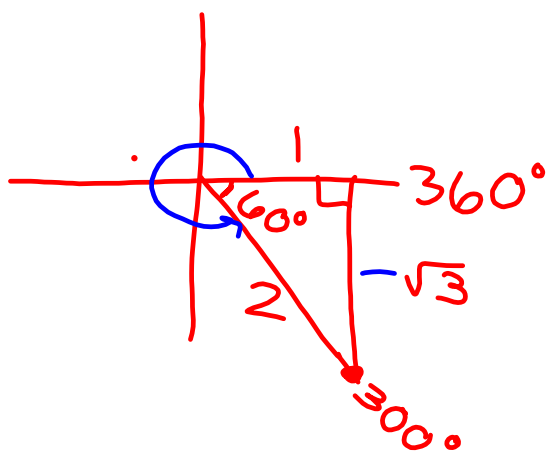
$$\tan 0^\circ = \frac{\sin 0^\circ}{\cos 0^\circ} = \frac{0}{1} = \boxed{0} \quad \tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{\text{opp}/\text{hyp}}{\text{adj}/\text{hyp}} = \frac{\sin \theta}{\cos \theta}$$

$$\sec 270^\circ = \frac{1}{\cos 270^\circ} = \frac{1}{0} \text{ (undefined)}$$



Find the trig function value of the given angle (note that they all have either a 30°, 45°, or 60° reference angle OR are quadrantal angles).

$$\tan 300^\circ = \boxed{-\sqrt{3}} \quad \sec(-135^\circ) = \boxed{-\sqrt{2}}$$



Homework:

Due next Wednesday, 11/13:

- "Do you know enough Algebra..." take home quiz

Due next Friday:

- 5.2 #35-75odd

omit 43-57

→ **New: 5.3 #1-35odd; 37-48all; 61-68all**

*5.2
35-41; 59-75odd*