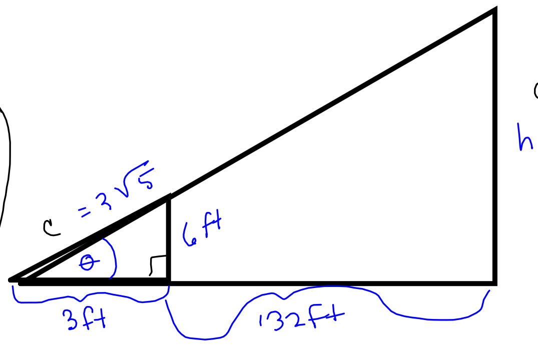
68. Height A six-foot-tall person walks from the base of a broadcasting tower directly toward the tip of the shadow cast by the tower. When the person is 132 feet from the tower and 3 feet from the tip of the shadow, the person's shadow starts to appear beyond the tower's shadow.

(a) Draw a right triangle that gives a visual representation of the problem. Show the known quantities of the triangle and use a variable to indicate the height of the tower.

(b) Use a trigonometric function to write an equation involving the unknown quantity.

(c) What is the height of the tower?

(a) $\boxed{h = \text{height of the tower, in feet}}$



$c^2 = 3^2 + 6^2 = 9 + 36 = 45$

$\Rightarrow$

$\sqrt{c^2} = |c| = \sqrt{45}$

$c = \pm\sqrt{45} = \pm 3\sqrt{5}$

Assume $c > 0$.

(b) $\frac{h}{135} = \sin\theta$ → Idiot. That's tangent.

(c) $\Rightarrow h = 135\sin\theta = (135)\left(\frac{6}{3\sqrt{5}}\right) = \frac{(135)(2)}{\sqrt{5}} = \frac{(135)(2)(\sqrt{5})}{5}$

$(27)(2)\sqrt{5} = \boxed{54\sqrt{5}\text{ ft} = h}$

Muh sine - Nooooooo!

Use tangent, Steve! Use TANGENT!

(b) $\boxed{\frac{h}{135} = \tan\theta} = \underbrace{\frac{6}{3} = 2 = \frac{h}{135} = 2}_{\text{helping us with (c)}}$ Way easier than I made it.

$\Rightarrow$

(c) $\Rightarrow h = 2 \cdot 135 = \boxed{270\text{ ft} = h}$

46. $\cos\beta = \frac{\sqrt{7}}{4}$

(a) $\sec\beta$

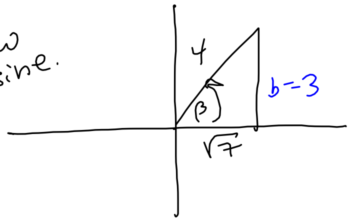
(c) $\cot\beta$

For a limited time only, everything in sight is in Q I.

$\cos\beta = \frac{\sqrt{7}}{4}$

$4^2 - \sqrt{7}^2 = 16 - 7 = 9$

$\Rightarrow$



cuz I just know cosine.

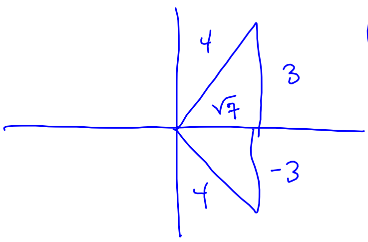
(a) $\sec\beta = \frac{1}{\cos\beta} = \frac{1}{\left(\frac{\sqrt{7}}{4}\right)}$

$= \boxed{\frac{4}{\sqrt{7}} = \sec\beta}$

(b) $\cot\beta = \frac{adj}{Opp} = \frac{1}{\tan\beta} = \frac{1}{\left(\frac{3}{\sqrt{7}}\right)} = \boxed{\frac{\sqrt{7}}{3} = \cot\beta}$

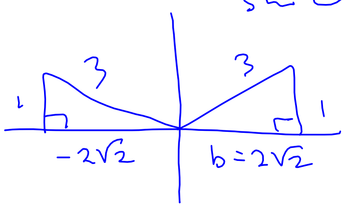
Duh. $\frac{\sqrt{7}}{3}$

By Test 1, the statement given will result in your drawing the following picture:



(Almost) always 2 pics for a given trig ratio!

$\sin\theta = \frac{1}{3}$



$3^2 - 1^2 = 9 - 1 = 8$

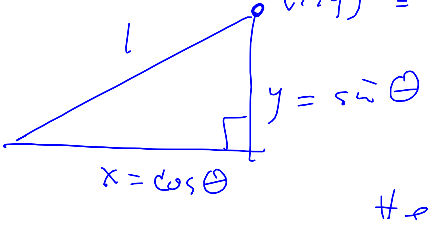
$\Rightarrow b = 2\sqrt{2} = \sqrt{8}$

In the future, bring your laptop/smartphone/etc. for in-class work. Much of what we do is self-paced and ON DEMAND, not an every-day boring lecture dictated by ME.

I know many of you were trained to be dictated to. You want to learn how to make headway without being lectured by someone you only listen to about 20% of the time, on a good day.

Pythagorean Identities

$(x,y) = (\cos\theta, \sin\theta)$



Pythagorus says

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

He also says

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

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

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

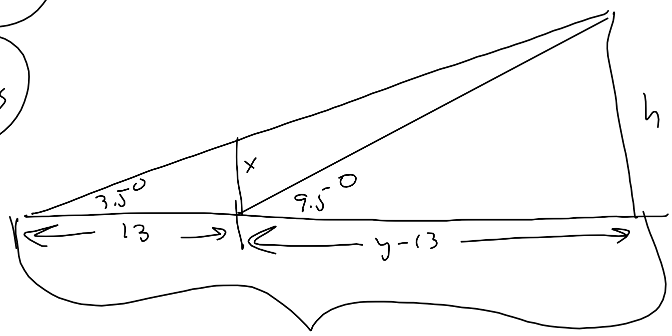
$$= \frac{1}{\cos^2\theta} = \underbrace{\left(\frac{1}{\cos\theta}\right)^2 = (\sec\theta)^2}_{\text{To help u.c.}} = \sec^2\theta$$

See?

Sweet!

72

73s



h = height of mtn, in miles

$\tan 3.5^\circ = \dfrac{x}{13} = \dfrac{h}{y} \Rightarrow h = y\tan 3.5^\circ$

$\tan 9^\circ = \dfrac{h}{y-13} \Rightarrow h = (y-13)\tan 9^\circ$ & $h=h \Rightarrow$

$\Rightarrow y\tan 3.5^\circ = (y-13)\tan 9^\circ = y\tan 9^\circ - 13\tan 9^\circ$

$\Rightarrow y\tan 3.5^\circ - y\tan 9^\circ = -13\tan 9^\circ$ Factor out 'y':

$\Rightarrow y(\tan 3.5^\circ - \tan 9^\circ) = -13\tan 9^\circ$

$\Rightarrow \boxed{y = \dfrac{-13\tan 9^\circ}{\tan 3.5^\circ - \tan 9^\circ}}$ The rest is calculator work.