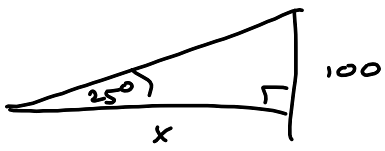
The sun is 25° above the horizon.

How long is the shadow of a 100-ft tower?

Let x = the length of the shadow (ft)



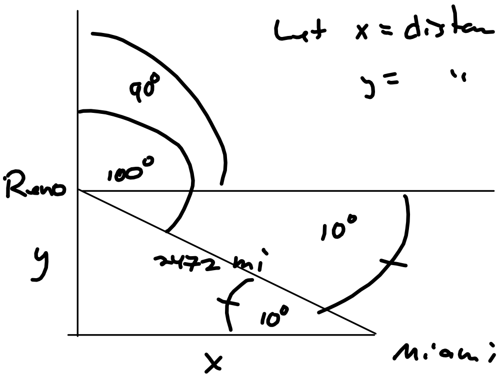
Round to 2 decimal places.

$\frac{100}{x} = \tan 25°$

$\frac{100}{\tan(25°)} = x \approx$ 214.450692051 ft $\approx \boxed{214.45 \text{ ft} \approx x}$

A jet leaves Reno, Nevada and is headed toward Miami, Florida at a bearing of 100°. The distance between the two cities is approximately 2472 miles.

(a) How far north and how far west is Reno relative to Miami? (Round your answers to two decimal places.)



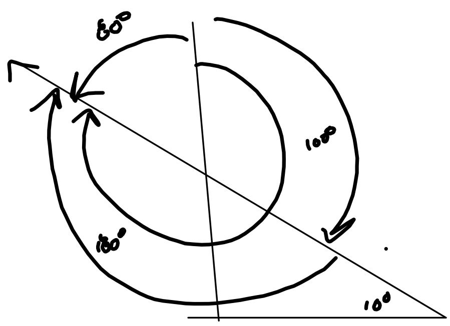
Let x = distance Reno is west of Miami (mi)
y = " " " north " " (mi)

$$\frac{y}{2472} = \sin 10^\circ$$

$$y = 2472 \sin 10^\circ$$

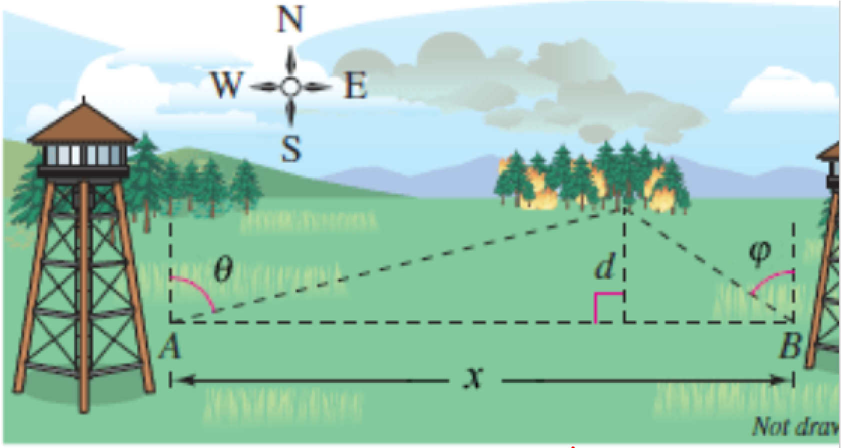
$$x = 2472 \cos 10^\circ$$

(b) If the jet is to return directly to Reno from Miami, at what bearing should it travel?



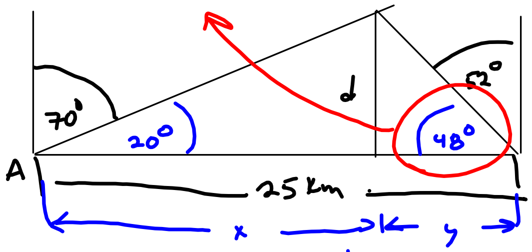
Bearing on return trip is 280°

Fire tower *A* is $x = 25$ kilometers due west of fire tower *B*. A fire is spotted from the towers, and the bearings from *A* and *B* are θ = N 70° E and φ = N 52° W, respectively (see figure). Find the distance *d* of the fire from the line segment *AB*. (Round your answer to two decimal places.)



d = distance from line segment $\overline{AB}$ (mi)

38° Not 48°!



x = distance from A to where the line d is (km)
y = distance from B to line d (km)

$x + y = 25$ (Auxiliary Eq'n)

$\frac{d}{x} = \tan 20°$ $\qquad \frac{d}{y} = \tan 48° = \frac{d}{25-x} \longrightarrow d = (25-x)\tan 48°$

$d = x \tan 20°$

$$d = d$$

$$x \tan 20° = (25-x)\tan 48°$$

$$= 25\tan 48° - x\tan 48°$$

$$x\tan 20° + x\tan 48° = 25\tan 48°$$

$$x(\tan 20° + \tan 48°) = 25\tan 48°$$

$$x = \frac{25\tan 48°}{\tan 20° + \tan 48°} \text{ km} \approx 18.8292673895 \text{ km}$$

$$d = x\tan 20° = \left(\frac{(25\tan 48°)(\tan 20°)}{\tan 20° + \tan 48°}\right) = d$$

$$\approx (18.8292673895)\tan 20°$$

oops! I used 48°, not 38°, b/c I can't subtract from 90°

Round to 2 places!

§1.8 # 21

Displacement	Amplitude	Period
$t=5$	5 cm	1.5 s

$5\cos(\omega(t-5))$

$\omega t = 2\pi$ when $t = 1.5$

$\omega = \frac{2\pi}{1.5} = \frac{2\pi}{\frac{3}{2}} = (2\pi)\left(\frac{2}{3}\right) = \frac{4\pi}{3}$

$$\boxed{5\cos\left(\frac{4\pi}{3}(t-5)\right)}$$

Section 2.1

Reciprocal Identities

$$\sin u = \frac{1}{\csc u} \qquad \cos u = \frac{1}{\sec u} \qquad \tan u = \frac{1}{\cot u}$$

$$\csc u = \frac{1}{\sin u} \qquad \sec u = \frac{1}{\cos u} \qquad \cot u = \frac{1}{\tan u}$$

Quotient Identities

$$\tan u = \frac{\sin u}{\cos u} \qquad \cot u = \frac{\cos u}{\sin u}$$

Pythagorean Identities

$$\sin^2 u + \cos^2 u = 1 \qquad 1 + \tan^2 u = \sec^2 u \qquad 1 + \cot^2 u = \csc^2 u$$

Cofunction Identities $= \sin\left(-\left(u-\frac{\pi}{2}\right)\right) = -\sin\left(u-\frac{\pi}{2}\right) = \cos(u)$

$$\sin\left(\frac{\pi}{2} - u\right) = \cos u \qquad \cos\left(\frac{\pi}{2} - u\right) = \sin u$$

$$\tan\left(\frac{\pi}{2} - u\right) = \cot u \qquad \cot\left(\frac{\pi}{2} - u\right) = \tan u$$

$$\sec\left(\frac{\pi}{2} - u\right) = \csc u \qquad \csc\left(\frac{\pi}{2} - u\right) = \sec u$$

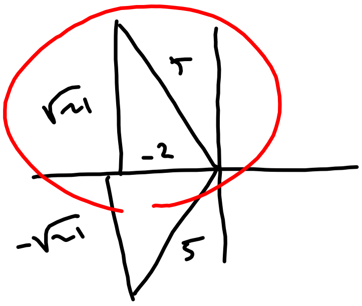
Even/Odd Identities

$$\sin(-u) = -\sin u \qquad \cos(-u) = \cos u \qquad \tan(-u) = -\tan u$$

$$\csc(-u) = -\csc u \qquad \sec(-u) = \sec u \qquad \cot(-u) = -\cot u$$

§2.1 # 9

$\sec(x) = -\frac{5}{2}$, $\tan(x) < 0$



$5^2 - 2^2 = 21$

$\cos(x) = -\frac{2}{5}$

Find the values of the remaining 5 trig functions.

$\sin(x) = \frac{\sqrt{21}}{5}$

$\cos(x) = -\frac{2}{5}$

$\tan(x) = -\frac{\sqrt{21}}{2}$

$\csc(x) = \frac{5}{\sqrt{21}}$

$\sec(x) = -\frac{5}{2}$

$\cot(x) = -\frac{2}{\sqrt{21}}$

Simplify

$\tan^2(x) - \sec^2(x) = \tan^2(x) - (\tan^2(x) + 1)$

$= \boxed{-1}$

Simplify #16 §2.1

$\cos(x)\left(1+\tan^2(x)\right) = \cos(x)\left(\frac{\cos^2(x)}{\cos^2(x)} + \frac{\sin^2(x)}{\cos^2(x)}\right)$

$= \cos(x)\left(\frac{1}{\cos^2(x)}\right) = \frac{1}{\cos(x)} = \sec(x)$

2.1 #18

$\frac{\csc^2(x) - 1}{\cos^2(x)} = \frac{\cot^2(x)}{\cos^2(x)} = \frac{\frac{\cos^2(x)}{\sin^2(x)}}{\frac{\cos^2(x)}{1}} = \frac{\cos^2(x)}{\sin^2(x)} \cdot \frac{1}{\cos^2(x)}$

$= \frac{1}{\sin^2(x)} = \boxed{\csc^2(x)}$

§2.1 #21

$$\frac{5\sin^2(x)-5}{\sin(x)-1} = \frac{5(\sin^2(x)-1)}{\sin(x)-1} = \frac{5(\sin(x)-1)(\sin(x)+1)}{\sin(x)-1}$$

$$= \boxed{5(\sin(x)+1)}$$

$\csc^4(x) - \cot^4(x)$

$= \left(\csc^2(x) - \cot^2(x)\right)\left(\csc^2(x) + \cot^2(x)\right)$

$= \left(\cot^2(x)+1 - \cot^2(x)\right)\left(\cot^2(x) + 1 + \cot^2(x)\right)$

$= (1)(2\cot^2(x)+1) = \boxed{2\cot^2(x)+1}$

FACTOR

$6\cos^2(x) + 13\cos(x) - 5$

Let $u = \cos(x)$. Then we have

$6u^2 + 13u - 5$

$(3u - 1)(2u + 5) = 6u^2 + 15u - 2u - 5$ ✓

$= (3\cos(x) - 1)(2\cos(x) + 5)$

$a = 6, b = 13, c = -5$

$b^2 - 4ac = 13^2 - 4(6)(-5)$

$= 169 + 120 = 289$

$= 17^2$

$u = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-13 \pm 17}{2(6)} = \frac{4}{12} = \frac{1}{3}$, $\frac{-30}{12} = \frac{-5}{2}$

$6\left(u - \frac{1}{3}\right)\left(u + \frac{5}{2}\right)$

$= 2 \cdot 3\left(u - \frac{1}{3}\right)\left(u + \frac{5}{2}\right)$

$= 3\left(u - \frac{1}{3}\right)(2)\left(u + \frac{5}{2}\right)$

$= (3u - 1)(2u + 5)$