Section 6.2
Solutions and Hints

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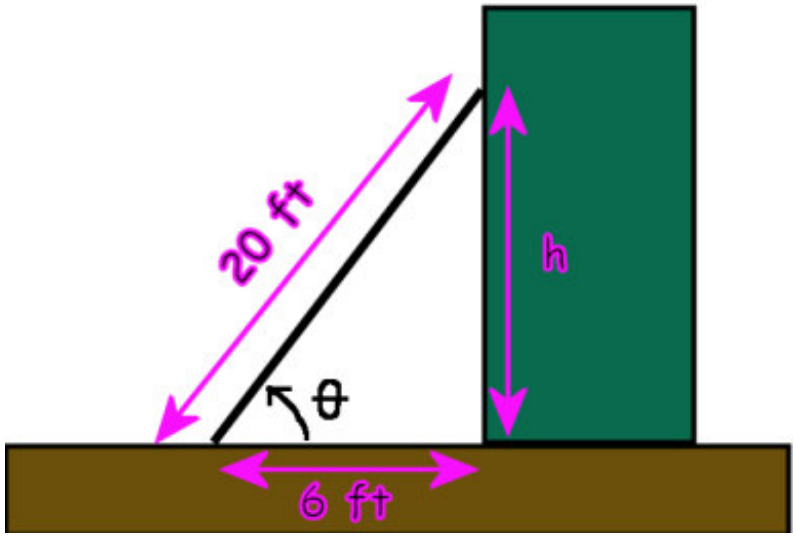
for the book:
Precalculus, Mathematics for Calculus 4th Edition
by James Stewart, Lothar Redlin and Saleem Watson.

40. A 20 foot ladder is leaning against a building. If the base of the ladder is 6 feet from the base of the building, what is the angle of elevation of of the ladder? How high does the ladder reach on the building?

Consider the below diagram:



Notice the building and the ground form a right angle. So we can use:

$\cos(\theta)$ = adjacent / hypotenuse = 6 / 20

So

$\theta = \cos^{-1}(6 / 20) \rightarrow \theta \sim= 72.54°$

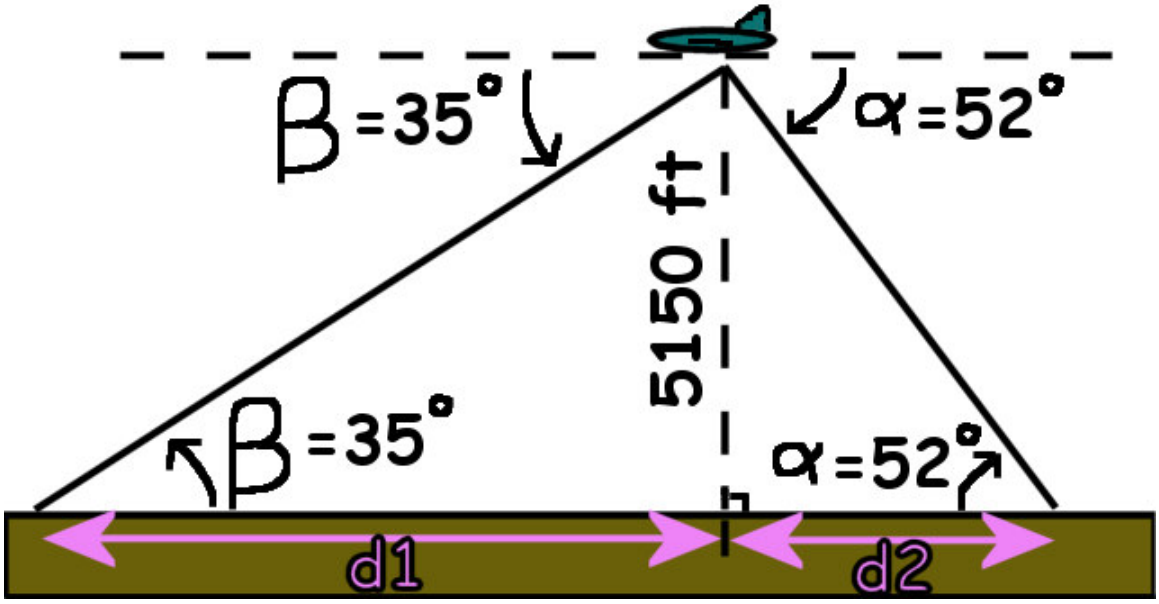
And we can find h in several ways, as this section is about trig functions we will use:

$\sin(\theta)$ = opposite / hypotenuse = h / 20

$\sin(\cos^{-1}(6 / 20)) = h /20 \rightarrow 20 * \sin(\cos^{-1}(6 / 20)) = h \rightarrow$ **19.07 ft ~= h**

46. An airplane is flying at an elevation of 5150 feet, directly above a straight highway. Two cars are driving on the highway on OPPOSITE sides of the plane. The angle of depression to one car is 35° and the angle of depression to the other car is 52°. How far apart are the cars?

Consider the below picture:



Notice the angle of depression from the plane to car 1 would equal the angle of elevation from the car to the plane (by definition). Likewise for car 2.

So if we drop a vertical line from the plane we create 2 right triangles, as shown above. Using trig functions we will find d1 and d2. And thus the distance between the cars will be equal to d1 + d2.

So

tan(35°) = opposite / adjacent = 5150 / d1
d1*tan(35°) = 5150
d1 = 5150 / tan(35°)
d1 ~= 7354.9 feet

And

tan(52°) = 5150 / d2
d2* tan(52°) = 5150
d2 = 5150 / tan(52°)
d2 ~= 4023.6 feet

And thus we have the distance between the two cars is about **11,378.5 feet**.