Question

A surveyor measures the angle of elevation to a point on a mountain that is 4 miles away to be 18 degrees. The vertical change in elevation from the point where the surveyor is standing to the point on the mountain is _____ miles. (Round your answer to the nearest hundredth of a mile.)

Solution
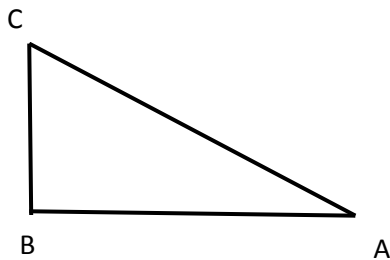
$$\angle A = 18°$$

$$AB = 4\, miles, BC-?$$

_____

$$\tan \angle A = \frac{BC}{AB}$$

$$\tan \angle A = \tan(18°) = 0.3249 = BC/4$$

The value of $\tan(18°) = \frac{\sin(18°)}{\cos(18°)}$ can be found from

$\sin(18°) = \frac{\sqrt{5}-1}{4} \approx 0.30902, \ \cos(18°) = \frac{\sqrt{10+2\sqrt{5}}}{4} \approx 0.95106$ (details can be found at

http://www.math-only-math.com/exact-value-of-cos-18-degree.html)

Thus,

$$\frac{BC}{4} = 0.3249.$$

$h = BC = 4 \cdot 0.3249 = 1.2996 \approx 1.3 \ (miles)$

Answer: $BC \approx 1.3$ miles.