1. (4pt) Find $l$ and $\theta$ in the figures below. Round to two decimal places. (Assume that the figures are not drawn to scale.)

$$\tan(36^\circ) = \frac{17}{l}$$

$$l = \frac{17}{\tan(36^\circ)} \approx 23.40$$

$$\theta = \text{arccos}(\frac{8}{10}) \approx 53.13^\circ$$

2. (3pt) A telephone pole is 40 ft tall. There is a cable which runs from the very top of the pole to the ground. For safety purposes it is required that the cable makes an angle of 75$^\circ$ with the ground. When such a telephone pole is installed, how far apart (on the ground) are the base of the pole and the base of the cable? Round to two decimal places.

$$\tan(75^\circ) = \frac{40}{l}$$

$$l = \frac{40}{\tan(75^\circ)} \approx 10.12\text{ ft}$$

3. (3pt) In a particular city, Market street, Exchange street, and State street meet at three different intersections forming a triangle. Exchange street and State street intersect at a right angle. If you leave the intersection of Exchange street and Market street then getting to State street is a 380 m trip along Exchange street and a 500 m trip along Market street. Find the acute angle at which State street and Market street intersect.

$$\sin(\theta) = \frac{380}{500}$$

$$\theta = \text{arcsin}(0.76) \approx 49.46^\circ$$
4. (10pt) Use the space below to answer the following questions. Make sure that you indicate and distinguish your answers clearly. All numerical answers should be left in exact form.

(a) Find $\theta$. (Do not assume that $\theta = 90^\circ$ in this computation; that's what you'll be showing in part (c) and you will need to know $\theta$ before you can justify it.)

(b) Find $y$.

(c) There is no right angle indicated in the largest triangle. However, it turns out to be a right triangle anyway. Explain why $\phi$ is a right angle.

(d) Find $x$.

\[
\text{(a) } l = \sqrt{30^2 + (30 \sqrt{3})^2} = 60
\]
\[
\tan(\theta) = \frac{20 \sqrt{3}}{60} \Rightarrow \theta = \arctan\left(\frac{\sqrt{3}}{3}\right)
\]
\[
\theta = 30^\circ
\]

\[
\text{(b) } \sin(30^\circ) = \frac{20 \sqrt{3}}{6}
\]
\[
y = \frac{20 \sqrt{3}}{\sin(30^\circ)} = \frac{20 \sqrt{3}}{\frac{1}{2}} = 40 \sqrt{3}
\]
\[
y = 40 \sqrt{3}
\]

\[
\text{(c) Since } \tan(a) = \frac{70 \sqrt{3}}{30} \text{ it follows that } a = \arctan\left(\frac{\sqrt{3}}{3}\right) = 60^\circ.
\]
\[
\text{Then } \phi = 180^\circ - \theta - a = 180^\circ - 30^\circ - 60^\circ
\]
\[
\Rightarrow \phi = 90^\circ.
\]

\[
\text{(d) } \tan(70^\circ) = \frac{40 \sqrt{3}}{x}
\]
\[
x = \frac{40 \sqrt{3}}{\tan(70^\circ)} = \frac{40 \sqrt{3}}{1.58}
\]
\[
x = 120
\]