Vector Practice Problems

Solve the following problems, first by drawing scale diagrams (a ruler and a protractor will help), then by redrawing the problem and solving by trigonometric methods.

1. A rectangular field has one side fence 500 meters long, and another side fence 700 meters long.
   a. What is the length of a diagonal across the field?
   b. What is the angle between the diagonal and the long side fence?

2. A vertical tree is 40 meters high. You look at the tree from 60 meters away on a level, horizontal surface.
   a. At what angle above the horizontal must you look to see the top of the tree?
   b. How far away (on a straight line) is the top of the tree?

3. A man walks 30 feet East, then 25 feet South.
   a. How far is the man away from where he started?
   b. In what direction (exactly) must he walk to return to his starting position?

4. A building of unknown height is located 200 meters from where you are standing. If you have to look at 25° above the horizontal to sight the top of the building, how high is it?

5. A man attempts to row across a river. He rows his boat directly across the current at 4 mph. The current is 2.5 mph down the river.
   a. At what angle does he head "downriver?"
   b. What is his overall speed with respect to the shoreline?

6. A force of 200 Newtons acts at 53.13° North of East.
   a. What is the Eastern component of the force?
   b. What is the Northern component of the force?
   c. What would we say is the Western component of the force?

7. A woman walks 200 meters East, then 300 meters at 36.87° North of East, then 200 meters due NW. How far is she from her starting point, and in what direction? (This question requires resolving each vector into components to apply trigonometry)

ANSWERS
   1. 860.2 meters; 35.5°
   2. 33.7°; 72.1 meters
   3. 39.1 feet; 39.8° N of W
   4. 93.3 meters
   5. 32°; 4.72 m/s
   6. 120 N; 160 N; –120 N
   7. 438.7 meters at 47° N of E