Math 196L **PROBLEM SET 4** **NAME:**

Instructions: Read each problem. Write a sentence or two about the approach you might take to solve each problem. Draw a picture to illustrate the scenario. Write a formula that might be needed to help set up or solve the problem.

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1. Troops are going to be staged starting 10 miles west and 20 miles north of the airport control tower and eventually reaching a point 70 miles east and 70 miles south of the tower walking the most direct path. You need to leave water and supplies for the troops positioned one third of the way and two thirds of the way along their route.

   (A) Where should you position the supplies in reference to the tower?

   (B) Find a general formula for the points that are one third and two thirds of the way along the path for general starting and ending positions.

2. A student is walking at a constant rate on Speedway, from Euclid to Campbell, a total distance of 0.9 miles. On the way, she will pass by Mountain, which is 0.5 miles from Euclid. Sketch graphs for the following:

   (A) Her distance from Euclid as a function of time.

   (B) Her distance from Campbell as a function of time.

   (C) Her distance from Mountain as a function of time.

3. A bird is collecting seed from a field that contains 100 grams of seed. The time in hours it takes to collect grams of seed is given by

$$f(z) = \frac{4z+1}{100-z} \qquad \text{with } 0 < \quad < 100$$

a) Find the inverse function of f.

b) Find the domain and range of the inverse function.

c) Calculate $f^{-1}(2)$ and give a practical interpretation.

4. Suppose the rate at which a rumor is spread in a town with a population of 1000 people is (jointly) proportional to the product of the number of people who have heard the rumor and the number of people who have not heard the rumor. Assume that the constant of proportionality is positive.

a) Write an equation for the rate as a function of the number of people who have heard the rumor.

b) What is the rate of spread when the entire town has heard the rumor? Explain.

c) How many people have heard the rumor at the instant when the rate of spread is at its maximum?