Math 120 D, E - Autumn 2006
Mid-Term Exam Number One
October 19, 2006

Name: _____   Section: _____

1	10	
2	10	
3	10	
4	10	
Total	40	

- Complete all questions.

- You may use a calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.

- If you use a trial-and-error or guess-and-check method, or read a numerical solution from a graph on your calculator when an algebraic method is available, you will not receive full credit.

- You may use one hand-written 8.5 by 11 inch page of notes.

- Show all work for full credit.

- You have 50 minutes to complete the exam.

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1. Mario is planning a walk through Circular Forest. Circular Forest is circular in shape, with a radius of 8 km. Mario will start his walk from a point 10 km west, and 4 km south of the center of the forest. He will walk due east until entering the forest, and then continue walking due east for one hour at which point he will turn and walk due north until he leaves the forest.

   If Mario walks at a constant speed of 5 km/hr, how long will he spend in the forest?

2. Jun has 900 meters of fencing with which to build two, separate rectangular enclosures. She wants them both to have the same shape, but she wants to take advantage of a river that runs through her land for one side of one of the enclosures.

RIVER
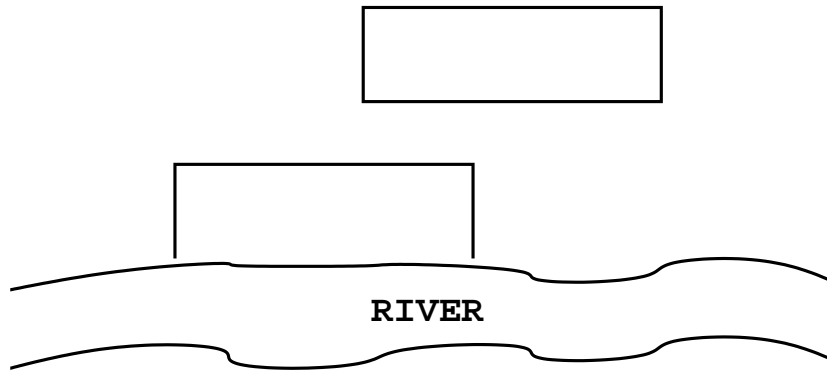
What should the dimensions of the enclosures be to get the maximum possible total area of the enclosures?

3. Maria and Bernardo are camped and cannot decide which way to go from there. They decide to try different directions. Bernardo leaves the camp at 6 AM and hikes north at 4 km/hr. Maria leaves the camp at 7 AM and hikes west at 5 km/hr.

When will they be 10 km apart?

4. We say that $x = k$ is a **fixed point** of a function $f(x)$ if

$$f(k) = k.$$

Let $g(x)$ be the multipart function

$$g(x) = \begin{cases} 3x + 19 & \text{if } x \leq 1, \\ 2x + 4 & \text{if } x > 1. \end{cases}$$

Find the fixed point(s) of $g(x)$.