

**MATH 1113A TEST I
TAKE-HOME PROBLEM**

FALL 2009

Instructions. You are allowed to work with other members of your rank group on this problem. You may also ask questions of the instructor and TAs for MATH 1113A. However, you may not ask anyone else for assistance on this problem. If you collaborate with group members, you must write up your final solution on your own. (For example, this means you may not read or copy other students' solutions. However, you may share scratch paper on which you've done computations to solve the problem.) **Attach your solution to this piece of paper with a staple. At the top of this sheet of paper, write your name.** If you worked with other members of your group, write the statement "I collaborated with _____", filling in the blank with the names of the group members with whom you collaborated. You may use computers, calculators, textbooks, notes, and the Internet as you need to solve this problem. However, to receive full credit, your solution must use only techniques we have covered in this course. You must also fully explain all of the steps of your work using *complete sentences*. (Think about your solution like it's to be graded against the DPS rubric.)

By signing on the line below, you certify that you have followed the rules above, including that you have not discussed this problem with anyone other than the members of your rank group, the instructor, and the TAs. You also certify that you have adhered to the Georgia Tech Honor Code, the principles of which are embodied by the Challenge Statement:

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community.

Student signature: _____

Due date. Your solution to this problem is due no later than 0810 on Friday, 25 September 2009, in class. Late work will not be accepted. In the event you cannot make it to class, send a digital copy to keller@math.gatech.edu before it is due.

Problem. Farmer Brown has a one-acre plot of cherry trees. If he plants at most 30 trees on his acre, the trees consistently yield 50 pounds per tree. However, for every tree beyond 30 that he plants, overcrowding causes the yield for each of his trees to decrease by one pound.

- (1) Find a function that represents the yield per tree (in pounds) if he plants t trees. What is the domain of this function?
- (2) Find a function that represents his total yield for all the trees on his acre if he plants t trees.
- (3) How many cherry trees should he plant to maximize his yield? What is that maximum yield?
- (4) What is the number of trees at which his plot becomes so overcrowded that the trees fail to produce any cherries?