Name ______________________ Section ________

Student Number ______________________

Math 120F (Midterm-Part I)
Autumn 1997

!!!!! READ READ READ !!!

Instructions:

- **Show your work; no credit for answers only.**
- **Make sure your exam has 4 pages.**
- **Write your name on the cover page. Include your student number on every page.**
- **If you are using a graphing calculator, "zooming in" to find a value on a function graph will not be sufficient justification for any answer on this exam. You are free to use the calculator to check yourself.**
- **When in doubt, ask a question by raising your hand. I will come around to help as soon as possible.**
- **Good Luck!**

Part I (40) ______________________

Part II (45) ______________________

Extra Credit (5) ______________________

TOTAL Score (85) ______________________

Student Number ________________

1. (27 points) A 25 year study of the student population of the Bedford Falls School District has just been completed. The total student population in year t is modeled by the quadratic function

$$p(t) = -3t^2 + 90t + 1325.$$

Also, the study shows that the male student population is modeled by a linear function. At the start of the study ($t = 0$), the male population is 500; at the end of the study ($t = 25$) the male population is 800.

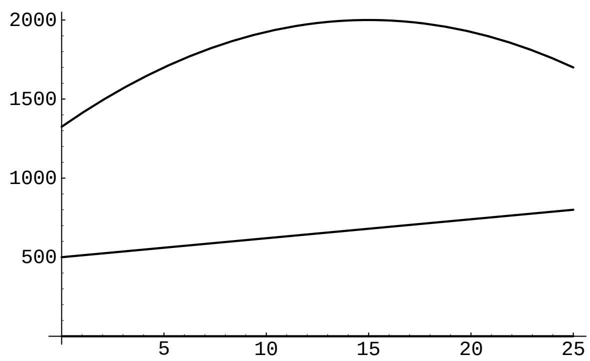
(a) (1 pt) What is the total student population at the start of the study?

(b) (3 pt) Find a linear function $m(t)$ that computes the male student population in year t.

(c) (5 pt) Find the maximum total student population during the study and determine when this occurs.

(d) (6 pt) Here are the graphs of $y = m(t)$ and $y = p(t)$ in a ty-coordinate system.

- Identify each curve as $y = m(t)$ or $y = p(t)$.
- Using the graphs, explain why there are two times when the total student population is 1800.
- Using the graphs, explain why there is no time when the male student population is 1000.
- Find the range of $y = p(t)$.



Name ________

Problem 2 continued.

(e) (4 pt) Using part (d), answer these questions:

- When is the total student population increasing?

- When is the total student population decreasing?

- When is the male student population increasing?

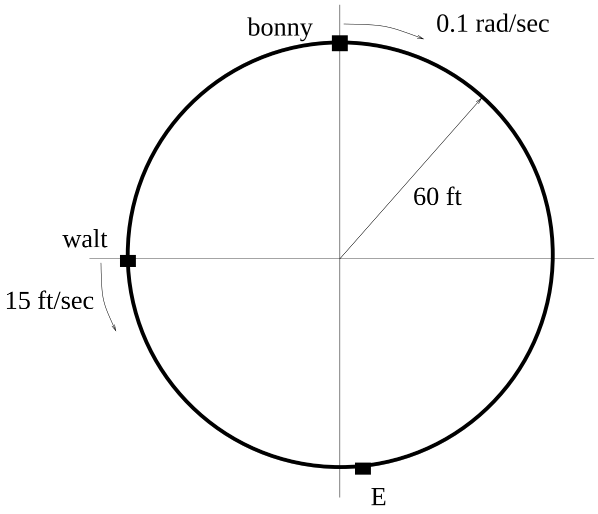
- When is the male student population decreasing?

(f) (2 pt) Give a formula for the function $f(t)$ that computes the number of female students in year t.

(g) (6 pt) Find the maximum female student population and when it occurs.

Student Number

2. (13 points) Walt and Bonny start at the positions indicated in the picture. They move around a circular track with the speeds and directions given.



(a) (2 pt) Find Walt's angular speed in units of "rad/sec".

(b) (2 pt) The position labeled "E" in the picture is 100 feet from Walt along the track. When will Walt reach the position E?

(c) (6 pt) Where is Walt located after 10 seconds? (Find his coordinates). Indicate Walt's position at time $t = 10$ by the label W(10) in the picture.

(d) (3 pt) When will Walt and Bonny pass for the first time?