

Math 111 D - Autumn 2005
Mid-Term Exam Number Two
November 10, 2005

Name: _____

Section: _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

Signature: _____

1	20	
2	20	
3	20	
Total	60	

- Please check that your exam contains 3 questions.
- 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 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.

1. You make and sell Things. Your total cost (TC) for making and selling q things is

$$TC(q) = 0.1q^2 + 100q + 25100$$

The market price for the Things is a linear function of the quantity q . If you make 100 Things, you can sell them each for 385 dollars. If you make 1000 Things, you can sell them each for 295 dollars.

(a) Express the market price as a linear function of q .

(b) What is the smallest quantity at which you would break even?

(c) What is your maximum possible profit?

(d) For what q is marginal cost equal to \$102.50 ?

2. Two cyclists, A and B, are in a race that started at noon. Cyclist A's instantaneous speed t hours after noon is given by the function

$$A(t) = 25 - 6t$$

and cyclist B's instantaneous speed t hours after noon is given by the function

$$B(t) = 15 + 9t.$$

The race is 32 miles long.

- (a) When will the two cyclists have the same instantaneous speed?

- (b) At what time will cyclist B's average trip speed be 16.5 mph?

- (c) How far does each cyclist travel from noon to 1 PM?

- (d) When does each cyclist reach the finish line? Who wins?

3. Two reservoirs, R and S, are being used and replenished at different rates. The amount of water (in thousands of gallons) in reservoir R is given by

$$R(t) = 0.1t^2 - 2.5t + 30$$

and the amount of water (in thousands of gallons) in reservoir S

$$S(t) = -0.3t^2 + 4t + 60$$

t hours after midnight.

- (a) When will reservoir S be empty?

- (b) When will the two reservoirs have the same amount of water in them?

- (c) What is the largest amount of water that reservoir S will have?

- (d) During what period of time is the level in both reservoirs decreasing?