

Math 111B,C - Winter 2003  
Mid-Term Exam Number Two  
February 25, 2003

Name: \_\_\_\_\_

Section: \_\_\_\_\_

1	19	
2	20	
3	10	
4	10	
Total	59	

- Complete all questions.
- Where needed, use the following definitions:

$$MC(q) = TC(q + 1) - TC(q)$$

$$MR(q) = TR(q + 1) - TR(q)$$

- You may use a calculator during this examination. Other electronic devices are not allowed.
- You may use one hand-written 8.5 by 11 inch page of notes. You may write on both sides of the note page.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

1. We are making and selling surfboard wax in 300 gram bars. To encourage large orders, we give quantity discounts by determining price per bar to be a linear function of the quantity ordered. If an order is for one bar, we charge \$8. For an order of 100 bars, we charge \$5 per bar.

(a) (5 points) Write a formula that gives the price  $p$  per bar for an order of  $q$  bars. Keep your answer in fraction form - don't use decimal approximations.

(b) (5 points) What is the revenue from an order of  $q$  bars?

(c) (5 points) Find the vertex of your revenue function.

(d) (2 points) What value of  $q$  results in the maximum revenue?

(e) (2 points) What is the maximum possible revenue?

2. The average variable cost (AC) of manufacturing an order of  $q$  titanium opera glass cases is

$$AC(q) = 4.53 + \frac{5000}{q}$$

while the revenue from selling  $q$  cases

$$TR(q) = 200q - q^2.$$

(a) Write out a formula for total cost (TC) as a function of  $q$ . Write it in the form  $TC = aq + b$ .

(b) What is the fixed cost (FC) ?

(c) What is the marginal revenue at  $q = 90$ ?

(d) For what  $q$  is  $MR = MC$ ?

3. You are in the business of manufacturing electric dog polishers. If you make and sell  $q$  **hundred** polishers this year, your revenue in **thousands** of dollars will be

$$TR = -15q^2 + 120q$$

while your costs in **thousands** of dollars will be

$$TC = 2q^2 + 4q + 38$$

Below, give the exact answer from your calculations - don't worry about what a fraction of a polisher means.

- (a) What is the smallest number of polishers you can make if you want to break even (i.e., have zero profit)?

- (b) How many polishers should you make if you want to make the most profit?

4. For the first 20 years of a eucalyptus tree's life, its growth rate is given by  $4 - 0.2t$  feet per year, where  $t$  is the number of years since it was planted.

(a) What is the tree's average rate of growth for the first 10 years of its life?

(b) Assume the tree's height was zero when it was planted. How tall is the tree after 15 years?