

MATH 111D
Exam II - Version 1
November 18, 2003

Name _____

Student ID # _____

Section _____

1	17	
2	16	
3	17	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- Write your answers in the specified locations. Unless otherwise indicated, you may round your **final answer** to two digits after the decimal.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- Any student found engaging in academic misconduct will receive a score of 0 on this exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (17 points) You sell *Things*. Your total revenue (in dollars) and total cost (in dollars) for q Things are given by the formulas:

$$TR(q) = 122q \text{ and } TC(q) = q^2 + 2781.$$

- (a) Find the quantity at which profit is largest.

ANSWER: $q =$ _____ Things

- (b) What is the largest possible profit?

ANSWER: \$ _____

- (c) Recall that $MC(q) = TC(q+1) - TC(q)$. Use this to find a formula for $MC(q)$. Simplify your formula and write it in the form $aq^2 + bq + c$.

ANSWER: $MC(q) = (\quad)q^2 + (\quad)q + (\quad)$

- (d) Find all positive quantities at which average cost (AC) is \$115 per Thing. (It's OK if your answers are not whole numbers. Round your final answers to two digits after the decimal.)

ANSWER: $q =$ _____ Things

2. (16 points) Water is flowing into two vats, vat V and vat W . The *rate* (in gallons per minute) at which water is flowing into vat V at time t is given by the formula:

$$v(t) = 2t + 7.$$

- (a) The rate at which water flows into vat W is a *linear* function of time: $w(t)$. At $t = 0$, water flows into vat W at a rate of 18 gallons per minute. At $t = 5$, water flows into both vats at the same rate. Find the formula for $w(t)$.

ANSWER: $w(t) =$ _____

- (b) If a vat is empty at time $t = 0$ and water flows into the vat at a rate of $mt + b$ (gallons per minute), then the amount of water in the vat at time t is $\frac{m}{2}t^2 + bt$ (gallons). Vat V is empty at time $t = 0$. Find the formula for $V(t)$, the amount of water in vat V at time t .

ANSWER: $V(t) =$ _____

- (c) Find the time(s) at which vat V contains 40 gallons.

ANSWER: $t =$ _____ minutes

- (d) Water flows in and out of a third vat, vat U , so that the amount of water in vat U at time t is given by

$$U(t) = -3t^2 + 48t + 10.$$

Set up an equation that you would solve in order to determine when vat U contains 20 more gallons than vat V . Put your equation in the form $at^2 + bt + c = 0$. Do not solve the equation.

ANSWER: $(\quad)t^2 + (\quad)t + (\quad) = 0$

3. (17 points) You sell *Items*. You charge

$$p = 68 - 2q$$

dollars for an order of q Items. Your average variable cost (in dollars per Item) is given by

$$AVC(q) = 3q + N,$$

where N is some number.

- (a) Give the longest interval, starting at $q = 0$, on which total revenue (TR) is increasing.

ANSWER: from $q = 0$ to $q =$ _____

- (b) The average variable cost at $q = 10$ is \$35.70 per Item. Use this fact to determine the value of the number N .

ANSWER: $N =$ _____

NOTE: You need the value of N to complete parts (c) and (d). If you are unable to find N in part (b), you may use $N = 3.2$ (which is not the correct answer) to do parts (c) and (d) and receive partial credit.

- (c) The value of fixed cost (FC) is \$20. Compute total cost at $q = 5$.

ANSWER: $TC(5) =$ \$ _____

- (d) Compute the marginal cost at $q = 6$ Items.

ANSWER: $MC(6) =$ \$ _____