

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

Name _____

Student ID # _____

Section _____

1	17	
2	17	
3	16	
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:

$$TR(q) = 72q \text{ and } TC(q) = q^2 + 716.$$

- (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 \$63 per Thing. (It's OK if your answers are not whole numbers. Round your final answers to two digits after the decimal.)

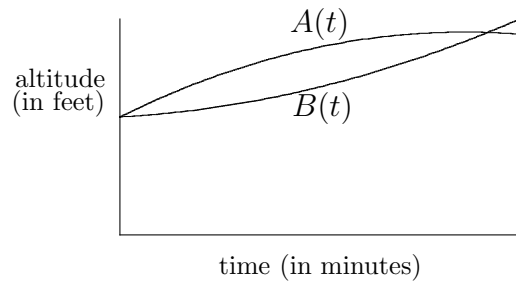
ANSWER: $q =$ _____ Things

2. (17 points) Two balloons, balloon A and balloon B , move vertically, up and down. Their respective altitudes (in feet) at time t (in minutes) are given by the formulas:

$$A(t) = -0.75t^2 + 18t + 150$$

$$\text{and } B(t) = 0.5t^2 + 2t + 150.$$

The graphs of their altitudes are given at right.



- (a) Find the time after $t = 0$ at which the balloons are at the same altitude.

ANSWER: $t =$ _____ minutes

- (b) Find the time at which balloon A is above balloon B by the greatest distance.

ANSWER: $t =$ _____ minutes

- (c) Write down the equation you would solve in order to answer the question: At what time is balloon A thirty feet higher than balloon B ? Put your equation in the form $at^2 + bt + c = 0$. Do not solve the equation.

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

- (d) A third balloon, balloon C , has an altitude formula that is a *linear* function of t . You know that at $t = 1$, balloon C is at the same altitude as balloon B and, at $t = 6$, balloon C is at the same altitude as balloon A . Find the formula for $C(t)$, balloon C 's altitude at time t .

ANSWER: $C(t) =$ _____

3. (16 points) You sell *Items*. Your total cost (in dollars) for producing q Items is given by

$$TC(q) = 3q^2 + Nq + 20,$$

where N is some number.

- (a) What is the value of fixed cost (FC)?

ANSWER: $FC = \$$ _____

- (b) The total cost for producing 10 Items is \$344. 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 $N = 7.4$ (which is not the correct answer) to do parts (c) and (d) and receive partial credit.

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

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

- (d) Items sell for \$34.50 each. Write an equation that you would solve in order to determine the quantity at which profit is \$50. Put your equation in the form $aq^2 + bq + c = 0$. Do not solve the equation.

ANSWER: () q^2 + () q + () = 0