

Math 111 - Winter 2009

Exam 2

February 19, 2009

Name: _____

Quiz Section: _____

Student ID Number: _____

1	16	
2	4	
3	14	
4	16	
Total	50	

- You are allowed to use a calculator, a ruler, and one **hand-written** 8.5 by 11 inch page of notes.
- Check that your exam contains all the problems listed above.
- You must **show and explain your work** on all problems. Specifically, if you use the quadratic formula or vertex formula you must write out the formula with the appropriate numbers (you won't get full credit if you do it all in your head or all in your calculator). The correct answer with no supporting work may result in no credit. We need to see where your answers are coming from.
- If you need more room use the back of the previous page and indicate to the grader that you have done so.
- 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. All suspicious behavior will be reported to the student misconduct board. In such an instance, you will be forced to meet in front of a board of professors to explain your actions. The board typically decides to either put a student on academic probation or to expel the student.
DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
- There are multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated.

GOOD LUCK!

1. (16 pts) The distance, in miles, from some starting line for **Car A** and **Car B** at time t hours are respectively given by

$$D_A(t) = t^3 - 7t^2 + 20t \quad \text{and} \quad D_B(t) = 70t - 2t^2.$$

- (a) (4 pts) Find and completely simplify the average trip speed formulas for **Car A** and **Car B**.

$$ATS_A(t) = \text{_____} \text{ mph}$$

$$ATS_B(t) = \text{_____} \text{ mph}$$

- (b) (4 pts) How long does it take **Car B** to travel the first 50 miles? (Round your answer to two digits after the decimal point)

$$t = \text{_____} \text{ hours}$$

- (c) (4 pts) Give all times when the average trip speed for **Car B** is 25 mph.

$$t = \text{_____} \text{ hours}$$

- (d) (4 pts) For each car, give the smallest **value** of the Average trip speed between the times $t = 1$ and $t = 20$ hours. (Explain your answers)

$$\text{smallest ATS value for } \mathbf{Car A} = \text{_____} \text{ mph}$$

$$\text{smallest ATS value for } \mathbf{Car B} = \text{_____} \text{ mph}$$

2. (4 pts) Once again, the distance formula for **Car B** is given by: $D_B(t) = 70t - 2t^2$. Write out and completely simplify the formula for the average speed for **Car B** over the two-hour interval starting at time, t . (Your answer will be in the form $at + b$)

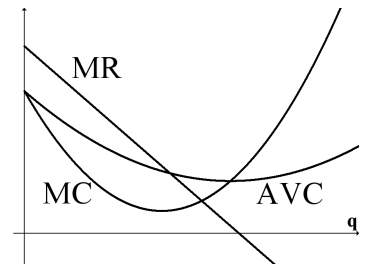
$$\frac{D_B(t+2) - D_B(t)}{(t+2) - t} = \underline{\hspace{10em}} \text{ mph}$$

3. (14 pts)

You sell *Items*. Your marginal revenue, marginal cost and average variable cost are given by the formulas:

$$MR(q) = 25 - 4q \quad MC(q) = q^2 - 10q + 19 \quad AVC(q) = \frac{1}{3}q^2 - 5q + 19,$$

where q is measured in **hundreds of Items** and marginal revenue, marginal cost, and average variable cost are in **dollars per Item**.



- (a) (6 pts) In addition, the fixed costs (FC) are \$200.00. Find and completely simplify the formulas for variable cost, total cost and average cost.

$$VC(q) = \underline{\hspace{10em}} \text{ hundreds of dollars}$$

$$TC(q) = \underline{\hspace{10em}} \text{ hundreds of dollars}$$

$$AC(q) = \underline{\hspace{10em}} \text{ dollars per item}$$

- (b) (4 pts) Find the quantity that maximizes profit. (Appropriately round to a whole number of Items)

_____ Items

- (c) (4 pts) Find the shutdown price.

_____ dollars per item

4. (16 pts) Your company sells tee shirts on a sliding price scale. The price per shirt p is given by the formula:

$$p = 22 - 2q,$$

where q is in **hundreds of shirts** and p is in **dollars per shirt**.

The total cost graph is a straight line such that $TC(0) = 3$ hundred dollars and $TC(4) = 19$ hundred dollars.

- (a) (4 pts) Find the formulas for total revenue and total cost. (Note from above that total cost is of the form $TC(q) = mq + b$.)

$$TR(q) = \text{_____} \text{ hundreds of dollars}$$

$$TC(q) = \text{_____} \text{ hundreds of dollars}$$

- (b) (4 pts) Find the marginal revenue at $q = 4$ (that is what is the additional revenue brought in from selling the 401st item)

$$\text{_____} \text{ dollars}$$

- (c) (4 pts) Find all quantities when profit is zero. (Round to the nearest shirt)

$$\text{_____} \text{ shirts}$$

- (d) (4 pts) Find the quantity that gives maximum profit and compute the maximum profit value. (Give your answers to the nearest shirt and nearest cent, respectively).

$$\text{_____} \text{ shirts}$$

$$\text{_____} \text{ dollars}$$