

NAME: \_\_\_\_\_

Student ID #: \_\_\_\_\_

QUIZ SECTION: \_\_\_\_\_

## Math 111, Midterm II

November 13th, 2008

Problem 1	12	
Problem 2	11	
Problem 3	15	
Problem 4	12	
<b>Total:</b>	<b>50</b>	

- Your exam should contain **5 pages in total and 4 problems**. Please check your test for completeness.
- You **must use the methods of this class to solve the problems, and you must show entirely how you get your answers**. Work done “in your head” cannot get credit. Work done by guessing and checking, or by reading off values on a graphing calculator may get little credit. Correct answers with incomplete, wrong or missing work will get partial credit at best.
- Write your final answer in the indicated spaces. Unless otherwise specified, you may round off your final answer to the nearest two decimal digits.
- If you need more room, use the backs of pages and indicate to the reader that you have done so.
- Read each question carefully.
- Raise your hand if you have a question.

GOOD LUCK!

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*Do you want me to post your grade so far on the class website under the last 4 digits of your Student Number?*

*Yes, please post my grade. Sign to give permission:* \_\_\_\_\_

*No, please don't post my grade so far.*

1. Your company, "RainCheck", produces extra-large umbrellas. The selling price is \$19.99 per umbrella. Each umbrella costs you \$9.50 to produce. Your fixed costs are \$250.

a) (4 points) Write down formulas in terms of quantity  $q$  of umbrellas (and/or numbers), for each of the following:

$$MR(q) = \underline{\hspace{10cm}}$$

$$MC(q) = \underline{\hspace{10cm}}$$

$$TR(q) = \underline{\hspace{10cm}}$$

$$TC(q) = \underline{\hspace{10cm}}$$

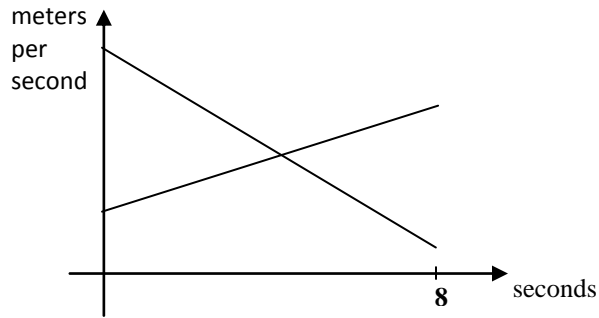
b) (4 points) What is the smallest number of umbrellas which you need to produce and sell in order to make at least \$50 in profit?

ANSWER:  $q = \underline{\hspace{2cm}}$  Umbrellas  
(your answer should be a whole number of umbrellas)

c) (4 points) At what quantity is your average cost \$14.50 per umbrella?

ANSWER: At  $q = \underline{\hspace{2cm}}$  Umbrellas

2. Two toy cars are traveling on the same track, and both pass the start line at time  $t = 0$ . The following functions and graphs are of the instantaneous speeds at  $t$  seconds for the two cars, during a 8-second trip.



$$s_A(t) = -1.4t + 12 \quad \text{in meters per second}$$

$$s_B(t) = 0.6t + 3 \quad \text{in meters per second}$$

- a) (3 points) What is the lowest instantaneous speed for car A during this 8 second trip?

ANSWER: \_\_\_\_\_ meters per second

- b) (4 points) When during this trip is the distance between the cars maximal? Which car is ahead at that time?

ANSWER: The distance between the two cars is max at  $t =$  \_\_\_\_\_ seconds (car \_\_\_\_\_ is ahead)

- c) (4 points) Write down the distance vs. time functions for each car, and find the maximal distance between the two cars during this trip.

$$D_A(t) = \underline{\hspace{10cm}}$$

$$D_B(t) = \underline{\hspace{10cm}}$$

ANSWER: max distance between the cars is \_\_\_\_\_ meters

3. You produce Widgets. Your Total Revenue and Variable Cost are given by the following functions:

$$TR(q) = -0.5q^2 + 6q$$

$$VC(q) = 0.01q^3 - 0.2q^2 + 1.5q$$

with quantity  $q$  in **hundreds of Widgets**, and the total revenue and variable cost in **hundreds of dollars**.

a) (5 points) Sketch the Total Revenue graph and find the maximum Total Revenue.



ANSWER: Maximum TR is \_\_\_\_\_ hundred dollars

b) (5 points) Find **all** the quantities  $q$  for which the Total Revenue is above \$1200.  
**Pay careful attention to units!**

ANSWER: From \_\_\_\_\_ to \_\_\_\_\_ **Widgets**  
*(your answer should be a range of whole numbers of Widgets)*

c) (5 points) Recall that the shutdown price can be computed as the lowest value of the average variable cost.  
 Compute the shutdown price. Include correct units.

ANSWER:  $SDP =$  \_\_\_\_\_ Units: \_\_\_\_\_

4. The distance, in miles, that a truck travels from its starting place in  $t$  minutes is given by the formula:

$$D(t) = t - 0.001 t^2$$

a) (4 points) How long did the truck take to travel the first 20 miles?

ANSWER: \_\_\_\_\_ minutes

b) (5 points) Find a formula in terms of  $h$  for the **average speed** of this truck **from  $t = 30$  to  $t = 30 + h$  minutes**. Simplify your formula as much as possible.

ANSWER:  $AS(h) =$  \_\_\_\_\_

c) (3 points) Another vehicle, a van, travels on the same road and in the same direction at a **constant speed** of 0.9 miles per minute, and reaches the starting place of the truck at  $t = 5$  minutes. Find the distance vs. time formula for the van,  $V(t)$ .

ANSWER:  $V(t) =$  \_\_\_\_\_