

MATH 111  
Exam II  
February 16, 2006

Name \_\_\_\_\_

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

Section \_\_\_\_\_

HONOR STATEMENT

“I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.”

SIGNATURE: \_\_\_\_\_

1	14	
2	15	
3	11	
4	10	
Total	50	

- Please check that your exam contains 4 problems on 4 pages.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method or read a value from a graph on your calculator when an algebraic method is available, you will not receive full credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (14 points) The total revenue (in dollars) and total cost (in dollars) for selling  $q$  **Hundred Things** are given by the formulas

$$TR(q) = -4q^2 + 80q \text{ and } TC(q) = 2q^2 + 5q + 80.$$

- (a) Compute the change in total revenue that occurs if you increase production from 200 Things to 250 Things.

ANSWER: \$ \_\_\_\_\_

- (b) Find the smallest quantity at which profit is \$75.

ANSWER:  $q =$  \_\_\_\_\_ Hundred Things

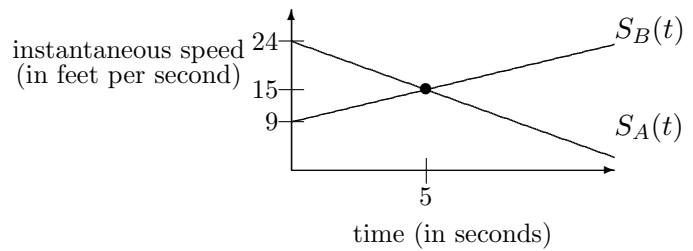
- (c) Give the longest interval on which profit is increasing.

ANSWER: from  $q =$  \_\_\_\_\_ to  $q =$  \_\_\_\_\_ Hundred Things

- (d) What is the maximum possible profit?

ANSWER: \$ \_\_\_\_\_

2. (15 points) Below are the graphs of the instantaneous speeds of two moving objects, Object  $A$  and Object  $B$ . At  $t = 0$ , both objects are in the same location. At  $t = 5$ , both objects have the same instantaneous speed, 15 feet per second.



- (a) Give the formula for each object's instantaneous speed.

ANSWERS:  $S_A(t) =$  \_\_\_\_\_  
 $S_B(t) =$  \_\_\_\_\_

- (b) In general, if an object's instantaneous speed is given the linear formula  $s = mt + b$ , then its distance is given by the formula  $d = \frac{m}{2}t^2 + bt$ .  
 Give the formula for each object's distance at time  $t$ .

ANSWERS:  $D_A(t) =$  \_\_\_\_\_  
 $D_B(t) =$  \_\_\_\_\_

- (c) What is the greatest distance between the two objects in the first six seconds?

ANSWER: \_\_\_\_\_ feet

- (d) Find the time at which Object  $A$ 's average trip speed is 19.77 feet per second.

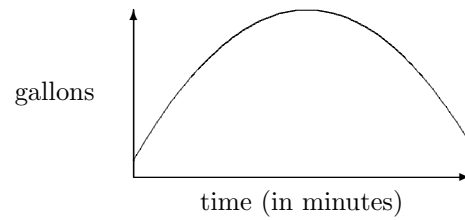
ANSWER:  $t =$  \_\_\_\_\_ seconds

3. (11 points)

The amount of water in a vat is given by the formula

$$V(t) = -2t^2 + 33t + 15,$$

whose graph is given at right.



(a) Give the longest interval of time on which the vat contains at least 20 gallons.

ANSWER: from  $t =$  \_\_\_\_\_ to  $t =$  \_\_\_\_\_ minutes

(b) At what time does the water reach its highest level?

ANSWER:  $t =$  \_\_\_\_\_ minutes

(c) The amount of water in a second vat is given by the formula  $U(t)$ . The second vat always contains exactly the same amount of water that the first vat contained 3 minutes before. Give a formula for  $U(t)$ , the amount of water in the second vat. Simplify so that your formula is in the form

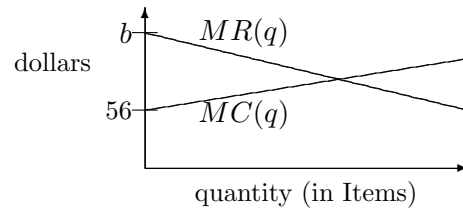
$$U(t) = at^2 + bt + c.$$

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

4. (10 points)

Marginal revenue and marginal cost for selling Items are both given by linear functions of quantity  $q$ . Their graphs are given at right and their formulas are

$$MR(q) = -6q + b \text{ and } MC(q) = 4q + 56.$$



(a) If profit is maximized when you sell  $q = 7$  Items, what is the value of  $b$ ?

ANSWER:  $b =$  \_\_\_\_\_

(b) What is the change in **total revenue** if  $q$  increases from 4 to 5 Items?

ANSWER: \_\_\_\_\_ dollars

(c) The formula for average cost is

$$AC(q) = 2q + 56 + \frac{338}{q}.$$

Find the breakeven price.

ANSWER: \$ \_\_\_\_\_