

Math 111 - Winter 2010

Exam 2

February 18, 2010

Name: \_\_\_\_\_

Quiz Section: \_\_\_\_\_

Student ID Number: \_\_\_\_\_

1	16	
2	19	
3	15	
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 force 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!

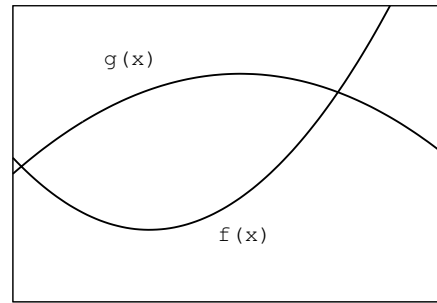


2. (19 points)

The graphs to the right are parabolas with formulas:

$$f(x) = x^2 - 6x + 18, \quad \text{and}$$

$$g(x) = -\frac{1}{2}x^2 + 5x + 16.$$



Give all final answer accurate to two digits after the decimal.

(a) (4 pts) Find all values of  $x$  at which the two graphs cross.

$$x = \underline{\hspace{10cm}}$$

(b) (4 pts) Find the longest interval when  $f(x)$  and  $g(x)$  are both increasing.

$$x = \underline{\hspace{10cm}} \text{ to } x = \underline{\hspace{10cm}}$$

(c) (4 pts) Find the size of the biggest vertical gap when  $g(x)$  is above  $f(x)$ .  
(That is, find the largest value of  $g(x) - f(x)$ .)

$$\underline{\hspace{10cm}}$$

(d) Let  $h(x)$  be a new parabola given by the relationship  $h(x) = f(x - 4)$ .

i. (4 pts) Write out the formula for  $h(x) = f(x - 4)$  and simplify into the expanded quadratic form,  $h(x) = (\ )x^2 + (\ )x + (\ )$ .

$$h(x) = \underline{\hspace{10cm}}$$

ii. (3 pts) Find the  $x$  and  $y$  values of the vertex for  $h(x)$ .

(Hint: There is a way to answer using the previous part and a way to answer directly from  $f(x)$ . Either way is fine, just show and explain your work.)

$$x = \underline{\hspace{10cm}}$$

$$y = \underline{\hspace{10cm}}$$

3. (15 pts) The total revenue for Items is given by  $TR(q) = -4q^2 + 78q$ , where  $q$  is in Items and  $TR(q)$  is in dollars.

The fixed cost ( $FC$ ) is 150 dollars and the marginal cost ( $MC$ ) is always a constant 8 dollars per Item. (In other words,  $TC(0) = 150$ ,  $TC(1) = 158$ ,  $TC(2) = 166$ , *etc.*)

- (a) (2 pts) From the description, total cost ( $TC$ ) is a linear function (*i.e.*  $TC(q) = mq + b$ ).  
Give the formula for Total Cost.

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

- (b) (4 pts) Find the largest quantity when the price per item is equal to the average cost per item. And give the value of profit at this item.

$$q = \underline{\hspace{10cm}} \text{ Items}$$

$$\text{Profit at this quantity} = \underline{\hspace{10cm}} \text{ dollars}$$

- (c) (5 pts) Recall  $MR(q) = TR(q + 1) - TR(q)$ . Find and simplify the formula for marginal revenue.

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

- (d) (4 pts) At what quantity  $q$  is the profit greatest? What is the greatest profit?

$$q = \underline{\hspace{10cm}} \text{ Items}$$

$$\text{Max Profit} = \underline{\hspace{10cm}} \text{ dollars}$$