

Math 111  
Exam 2  
November 22, 2016

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

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

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

1	13	
2	16	
3	10	
4	11	
Total	50	

- Check that your exam contains four pages of problems in addition to this cover page.
- You are allowed to use a Ti-30x IIS Calculator, a ruler, and one **hand-written** 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- You must **show your work** on all problems. Using appropriate algebra methods from class, you must provide work that shows how you got your answer (guess and check does NOT get full credit). If you want more space, you can write on the backs of the previous page and indicate to the grader that you have done so.
- Put your final answer on the lines provided with the problems.
- Raise your hand if you have a question. Your TA can only clarify the wording of a question, he/she cannot comment on your work.
- 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. 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 meet in front of a board of professors to explain your actions.  
DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!  
WE WILL REPORT YOU AND YOU MAY BE EXPELLED!  
Keep your eyes down and on your paper. If your TA sees your eyes wandering they will warn you only once before taking your exam from you.
- You have 50 minutes to complete the exam. Use your time wisely: Spend no more than 10 minutes on each page before moving on to the next page.

GOOD LUCK!

1. (13 points) A company sells items. The **total costs** are given by  $TC(x) = \frac{1}{4}x^2 + 13x + 50$  dollars, and the **selling price**,  $p$ , for an order of  $x$  items is given by  $p = 51 - \frac{3}{4}x$  dollars per item, where  $x$  is in items. Round your final answers to the nearest item or nearest cent.

- (a) Find and simplify the formulas for total revenue, average cost and average variable cost.

$$TR(x) = \text{_____} \text{ dollars}$$

$$AC(x) = \text{_____} \text{ dollars per item}$$

$$AVC(x) = \text{_____} \text{ dollars per item}$$

- (b) Find the range of quantities over which **total revenue** is greater than or equal to \$567.

$$\text{from } x = \text{_____} \text{ to } x = \text{_____} \text{ items}$$

- (c) Find the quantity and selling price that give the maximum **profit**.

$$x = \text{_____} \text{ items}$$

$$p = \text{_____} \text{ dollars/item}$$

2. (16 points) A company sells items. Total revenue is given by  $TR(x) = 30x - 2x^2$  **hundred** dollars, the fixed costs are \$2300 (23 **hundred** dollars) and average variable costs are given by  $AVC(x) = 3x^2 - 11x + 30$  dollars per item, where  $x$  is in **hundreds** of items. Round your **final answers** to the nearest item or nearest cent.

(a) What is the total cost to produce 200 **items**? (include units)

\_\_\_\_\_ Units: \_\_\_\_\_

(b) Find the longest interval over which  $AVC(x)$  and  $TR(x)$  are both increasing.

from  $x =$  \_\_\_\_\_ to  $x =$  \_\_\_\_\_

(c) Recall:  $MR(x) = \frac{TR(x + 0.01) - TR(x)}{0.01}$ .

Find and *completely simplify* the formula for marginal revenue.

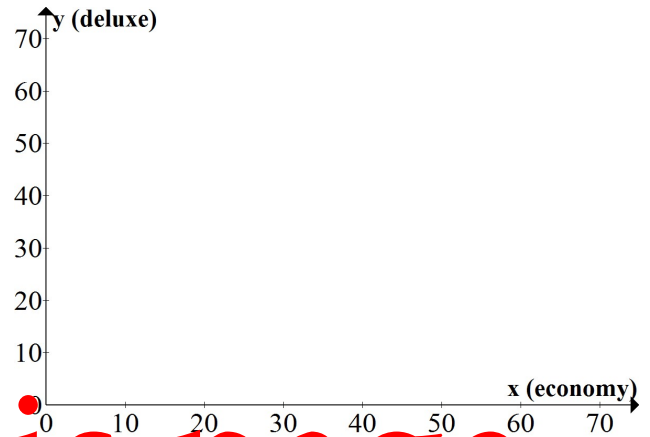
$MR(x) =$  \_\_\_\_\_

(d) Find a positive quantity at which total revenue equals variable cost.

$x =$  \_\_\_\_\_

3. (10 pts) The Wellbuilt Company manufactures two types of wood chippers, economy and deluxe. Each economy chipper requires 3 hours to assemble, 2 hours to paint, and results in \$30 of profit. Each deluxe chipper requires 4 hours to assemble, 2 hours to paint, and results in \$25 of profit. Today, the company is limit to at most 156 hours of assembly and at most 90 hours of painting. Let  $x$  be the number of **economy** wood chippers the company produces today, and let  $y$  be the number of **deluxe** wood chippers the company produces today.

- (a) Give the constraints, then sketch and shade the feasible region (**clearly** label corners). You **must** show your algebra in finding all intersection points.



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we no longer  
cover this topic

- (b) How many units of each model should be produced today to maximize profit?  
(Show the calculations to prove you checked all appropriate points)

$x =$  \_\_\_\_\_ economy wood chippers

$y =$  \_\_\_\_\_ deluxe wood chippers

4. (11 pts)

(a) For a certain commodity, the supply curve is **linear**.

The quantity supplied is  $q = 10$  items, when the price is  $p = \$10/\text{item}$ , and the quantity supplied is  $q = 40$  items, when the price is  $p = \$100/\text{item}$ .

i. Find and simplify the equation of the line for the supply curve.

$$p = \underline{\hspace{2cm}}$$

ii. In addition, the demand curve is given by  $pq + 20q = 1452$ . Find the quantity and price that correspond to market equilibrium.

$$q = \underline{\hspace{2cm}} \text{ items}$$

$$p = \underline{\hspace{2cm}} \text{ dollars/item}$$

(b) Solve  $8(1 + e^{2t}) - 5 = 19$ .

Give your final answer **as a decimal**, accurate to three digits after the decimal.

$$t = \underline{\hspace{2cm}}$$