

Math 111
Exam 1
January 28, 2010

Name: _____

Quiz Section: _____

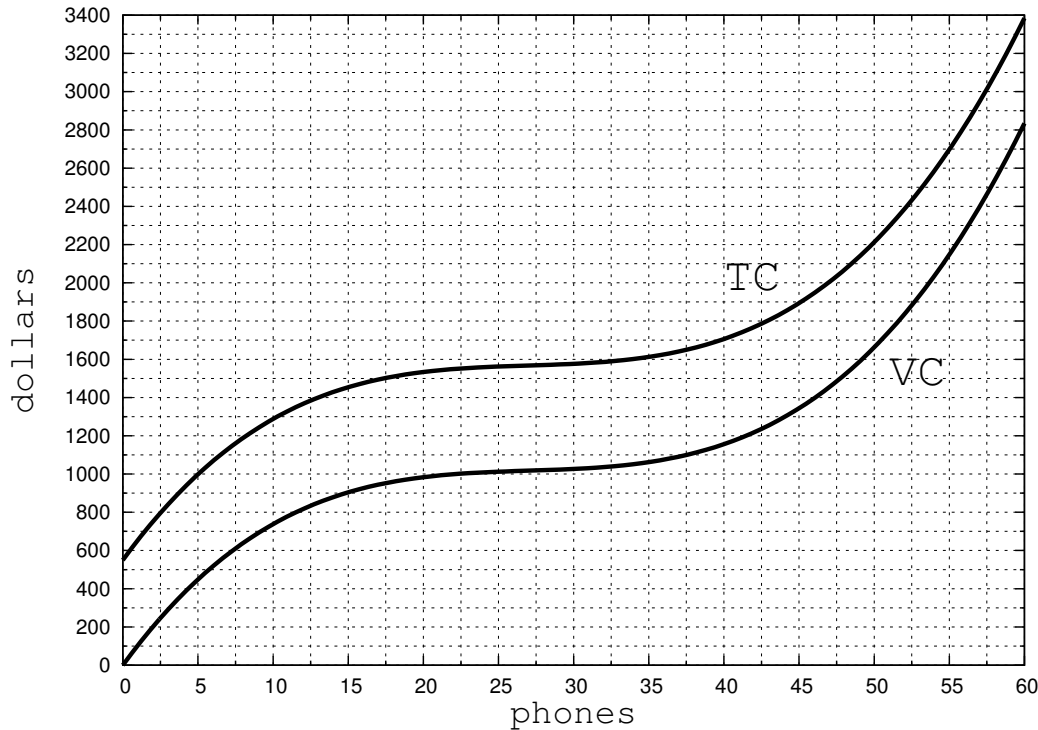
Student ID Number: _____

1	17	
2	16	
3	17	
Total	50	

- You are allowed to use a 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.
- Check that your exam contains all the problems listed above.
- You must **show your work** on all problems. On problems in which you use a graph, draw lines and *clearly* label them in the graph. Your work and explanations on each problem should be very brief, so you should be able to fit them in the space provided. However, 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 can in no way comment on your work. So don't raise your hand fishing for answers.
- 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 be forced to 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 15 minutes on each page before moving on to the next page.

GOOD LUCK!

1. (17 points) Shrek produces and sells mobile phones. The graphs of **total cost** and **variable cost** for producing phones are given. The x -axis is in phones and the y -axis in in dollars.



- (a) (3 pts) Find the **Shutdown Price (SDP)**.

$$SDP = \underline{\hspace{2cm}} \text{ dollars per phone}$$

- (b) (3 pts) Find the **marginal cost** at $q = 10$ phones.

$$MC(10) = \underline{\hspace{2cm}} \text{ dollars per phone}$$

- (c) (3 pts) Find all quantities at which **average variable cost** is \$36.00 per phone.

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

- (d) Suppose the market price is \$55.00 per phone.

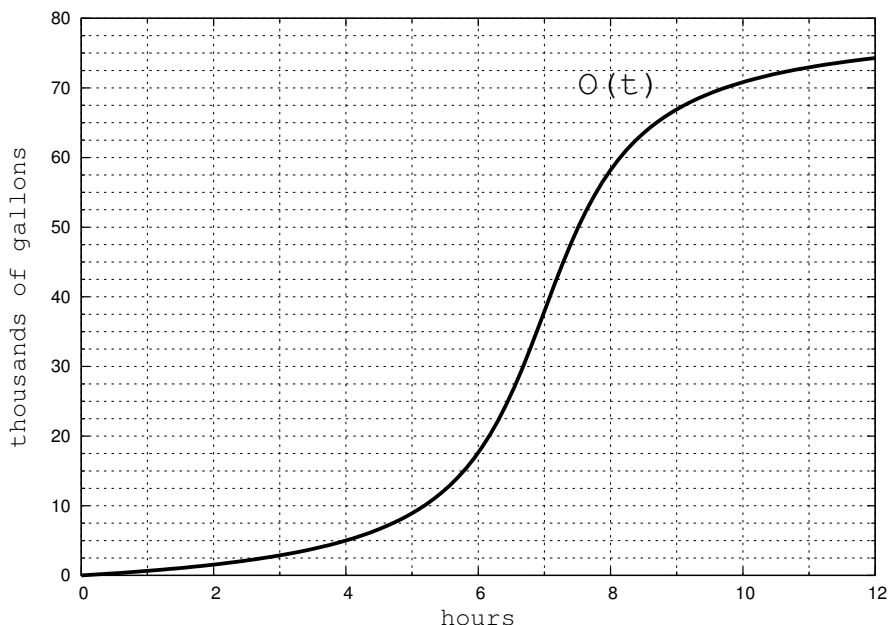
- i. (2 pts) Sketch and label the graph of **total revenue** on the axes above.
- ii. (3 pts) Find the largest interval over which Shrek's profit is negative, but his losses are less than **fixed costs**. (That is, these are the quantities when he losses money, but he should still stay open.)

$$q = \underline{\hspace{2cm}} \text{ to } q = \underline{\hspace{2cm}} \text{ phones}$$

- iii. (3 pts) Find the value of the maximum profit.

$$\underline{\hspace{2cm}} \text{ dollars}$$

2. (16 points) A town is using water from a reservoir that is being refilled by an aquaduct. The graph below shows the total water drawn from the reservoir, $O(t)$, in thousands of gallons at time, t , hours after midnight.



- (a) (3 pts) Find an interval of length 2 over which the overall rate of flow out of the reservoir changes from increasing to decreasing.

$$t = \underline{\hspace{2cm}} \text{ to } t = \underline{\hspace{2cm}} \text{ hours}$$

- (b) Consider the following equation: $\frac{O(t+3) - O(t)}{3} = 6$.

i. (2 pts) Translate the equation into English using appropriate units.

ii. (3 pts) Find all times, t , for which the equation is true.

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

- iii. (2 pts) Find all times, t , when $\frac{O(t+0.1) - O(t)}{0.1} = 6$.

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

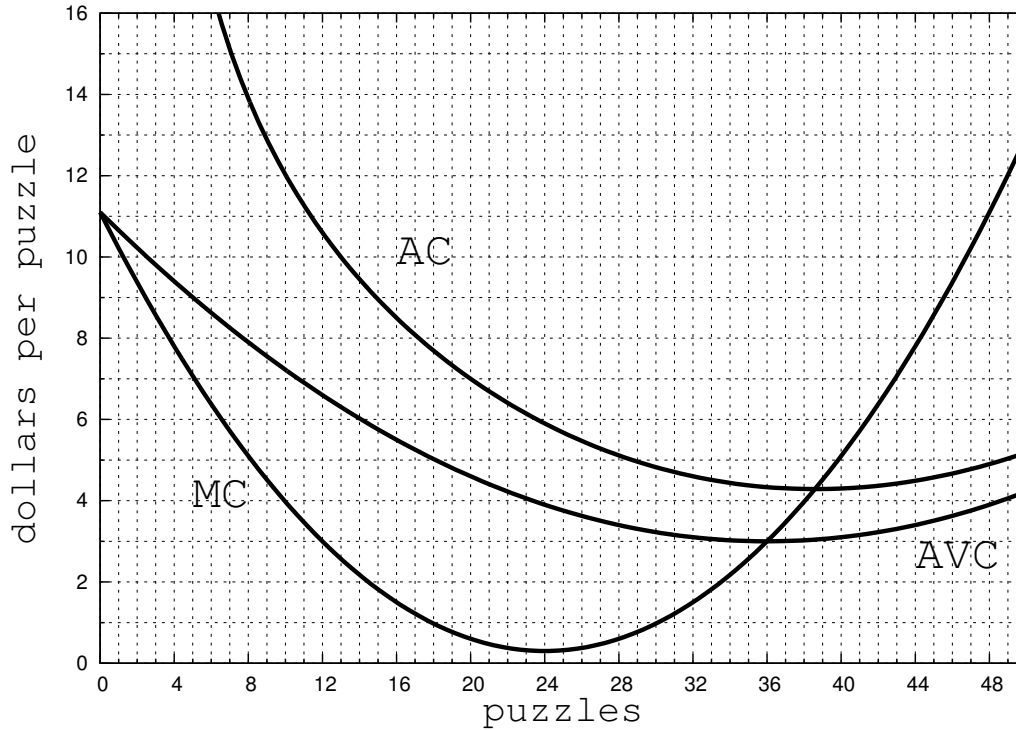
- (c) (3 pts) Suppose the aquaduct was filling the reservoir at a constant rate of 5 thousand gallons per hour. How much water would there have to be in the reservoir at midnight for the town to get all the water it needed for the 12 hours shown?

$$\underline{\hspace{2cm}} \text{ thousand gallons}$$

- (d) (3 pts) Suppose the reservoir had 40 thousand gallons at midnight and was being filled by the aquaduct at a constant rate. How small could that rate be and provide enough water for the town for the 12 hours shown?

$$\underline{\hspace{2cm}} \text{ thousand gallons per hour}$$

3. (17 points) Danny is producing and selling a particular jigsaw puzzle. Below are the graphs of **marginal cost**, **average cost**, and **average variable cost** for producing puzzles.



(a) Find each of the following:

- i. (3 pts) The Break Even Price (BEP)

BEP = _____ dollars per puzzle

- ii. (3 pts) The **variable cost** at $q = 18$ puzzles.

_____ dollars

- iii. (3 pts) A 3-hour interval over which $TC(q + 1) - TC(q)$ decreases and then increases.

$q =$ _____ to $q =$ _____ puzzles

(b) Suppose the **market price** is \$5.50 per puzzle

- i. (2 pts) Sketch and label the graph of **marginal revenue** on the axes above.
 ii. (3 pts) Find the quantity at which profit is maximized.

$q =$ _____ puzzles

- iii. (3 pts) If Danny sells exactly 33 puzzles at this market price, what is his profit?

_____ dollars