

Math 111 A - Winter 2014
Mid-Term Exam Number One
February 6, 2014

Name: _____

Student ID no. : _____

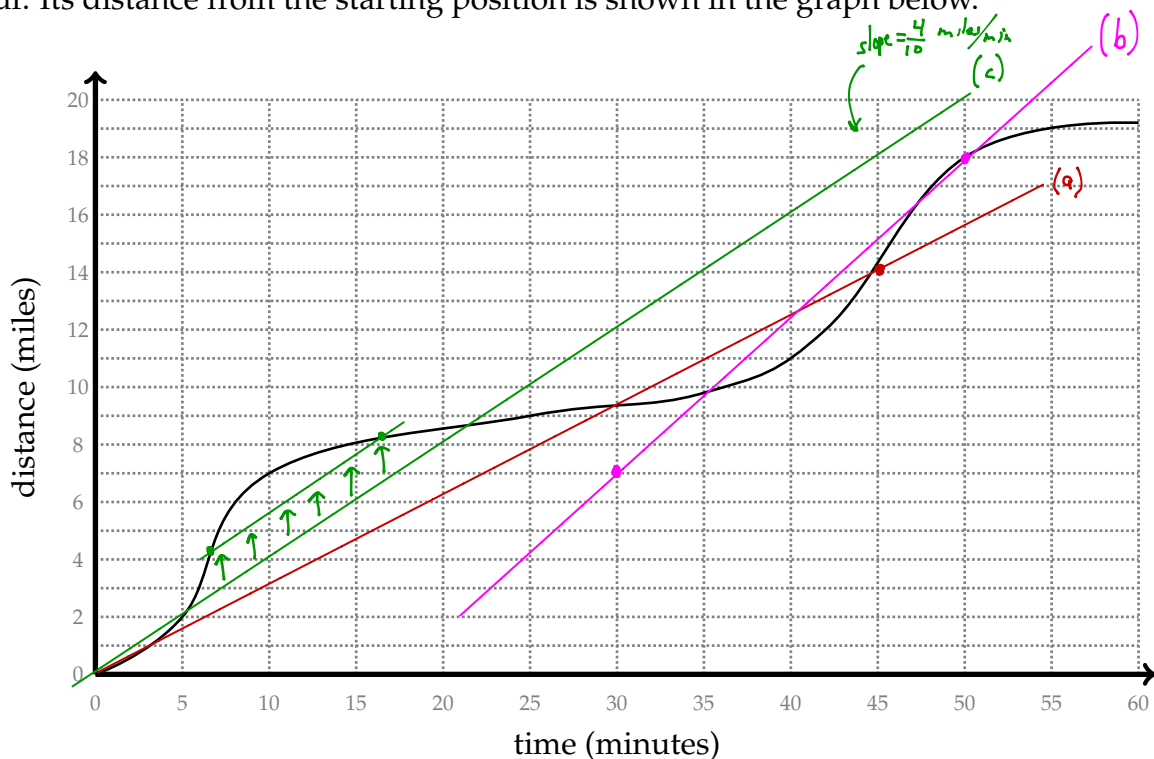
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Section: _____

1	16	
2	16	
3	12	
4	6	
5	10	
Total	60	

- Complete all five problems. Make sure that there ARE five problems.
- Show all work for full credit. Most of the problems involve reading graphs. Clearly show your work on the graph.
- If you need extra space, you may write on the back of each page, but **please indicate that you have done so**. Otherwise, the grader might miss your work and not award credit.
- You may use a scientific calculator during this exam. Graphing calculators are not permitted. Also, other electronic devices are not allowed, and should be turned off and put away for the duration of the exam.
- You do not need to simplify your answers.
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 50 minutes to complete the exam.

1. [4 points per part] A flappy bird flies in one direction across the sky over the course of an hour. Its distance from the starting position is shown in the graph below.



- (a) Find the average trip speed at 30 minutes.

$$\frac{14}{45} = 0.31 \text{ miles/minute}$$

- (b) Find the average speed from 35 minutes to 50 minutes.

$$\frac{18-7}{50-35} = 0.56 \text{ miles/minute}$$

- (c) Find a 10-minute time interval in which the bird traveled 4 miles.

(There are a few possible answers; you only need to give one.)

6.5 to 16.5 minutes

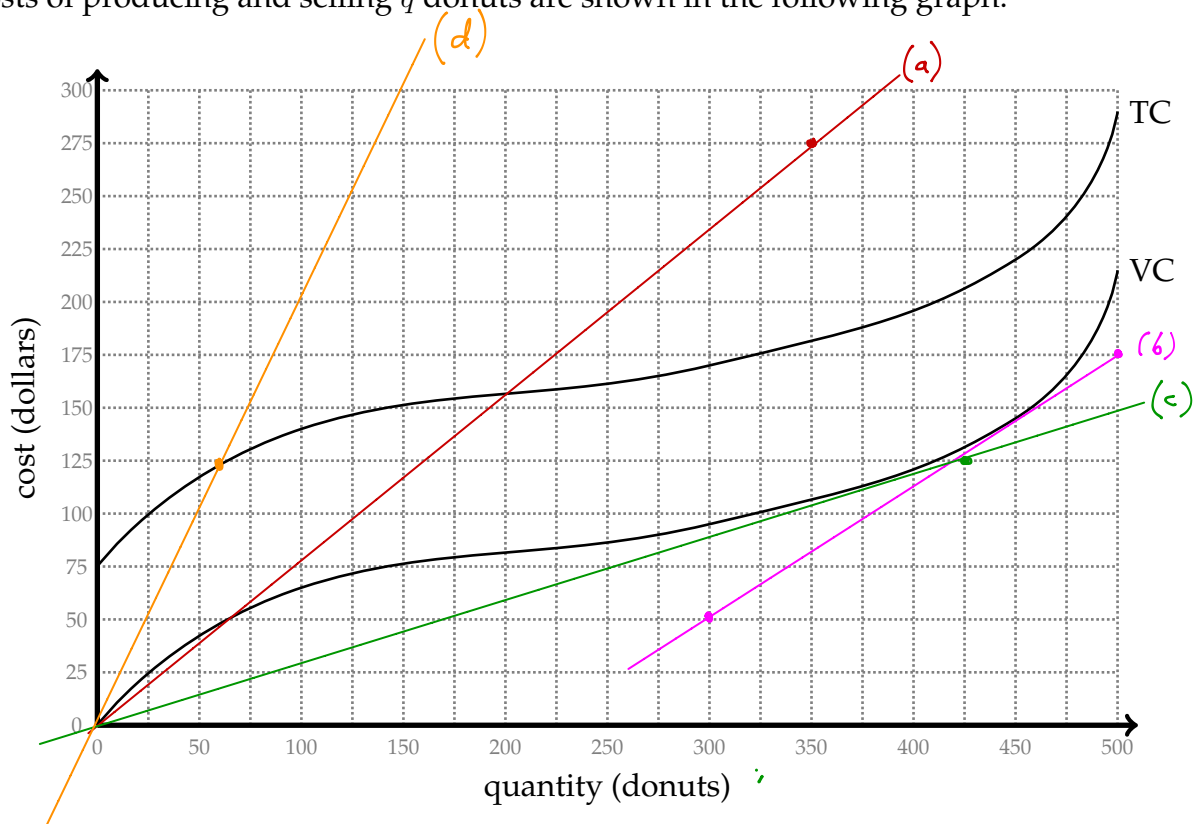
- (d) Let $D(t)$ denote the distance the bird has traveled after t minutes.

Translate the following inequality into plain English:

$$\frac{D(15) - D(5)}{15 - 5} > \frac{D(30) - D(20)}{30 - 20}$$

The average speed from 5 to 15 minutes was greater than the average speed from 20 to 30 minutes.

2. [4 points per part] You are in the business of selling donuts. The total costs and variable costs of producing and selling q donuts are shown in the following graph:



- (a) Compute the **average cost** of producing 200 donuts.

$$\frac{275}{350} = 0.79 \text{ dollars/donut}$$

- (b) Compute the **marginal cost** at $q = 450$ donuts.

$$\frac{175 - 50}{500 - 300} = 0.63 \text{ dollars/donut}$$

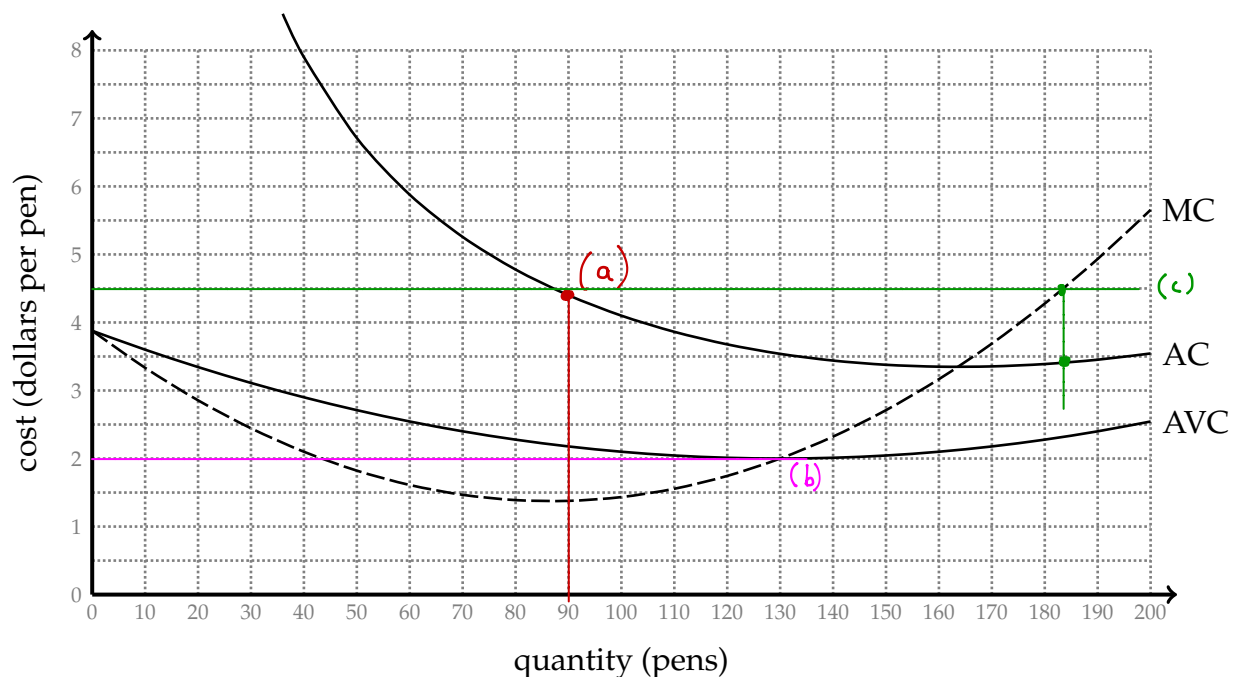
- (c) Compute the **shutdown price**.

$$\frac{125}{425} = 0.29 \text{ dollars/donut}$$

- (d) Suppose you sell donuts at a price of \$2 per donut. How many do you have to produce and sell to break even?

About 60.

3. [4 points per part] You sell fancy pens. The marginal cost, average cost, and average variable costs for producing and selling q pens are shown in the table below.



- (a) Compute the **total cost** of producing 90 pens.

$$TC(q) = AC(q) \times q$$

$$TC(90) = 4.4 \times 90 = 396 \text{ dollars.}$$

- (b) Suppose you sell pens at a price of \$2.50 per pen. Should you shut down production? Explain.

No: The shutdown price is the min. value of AVC, about \$2.

- (c) Suppose instead that you sell pens at a price of \$4.50 per pen. What is the maximum possible profit?

Max profit occurs where $MR = MC$. $MR = \$4.50$, so we draw a line at 4.5. This crosses MC at $q = 183$. At $q = 183$,

$$AC = 3.45, \text{ so } TC = 3.45 \times 183 = 631.35, \text{ and } TR = 4.50 \times 183 = 823.50.$$

$$\text{Profit} = TR - TC = 823.50 - 631.35 = \$192.15$$

4. [6 points] Solve the inequality. Express your answer in the form " $x > a$ " or " $x < a$ " for some number a .

$$2(x - 5) + 7 < \frac{12x + 15}{3} + 1$$
$$2x - 10 + 7 < 4x + 5 + 1$$
$$2x - 3 < 4x + 6$$
$$-2x < 9$$
$$x > -4.5$$

5. (a) [5 points] Give an equation for the line that passes through the points $(-1, 3)$ and $(7, -2)$.

Slope: $\frac{-2-3}{7-(-1)} = \frac{-5}{8}$

$$y = \frac{-5}{8}(x-7) + (-2)$$

or $y = \frac{-5}{8}x + \frac{19}{8}$

- (b) [5 points] What is the x -intercept of that line?

$$0 = \frac{-5}{8}(x-7) - 2$$
$$2 = \frac{-5}{8}(x-7)$$
$$\frac{16}{-5} = x-7$$
$$\frac{16}{-5} + 7 = x$$
$$x = 3.8$$