

MATH 111
Final Exam
Winter 2014

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."

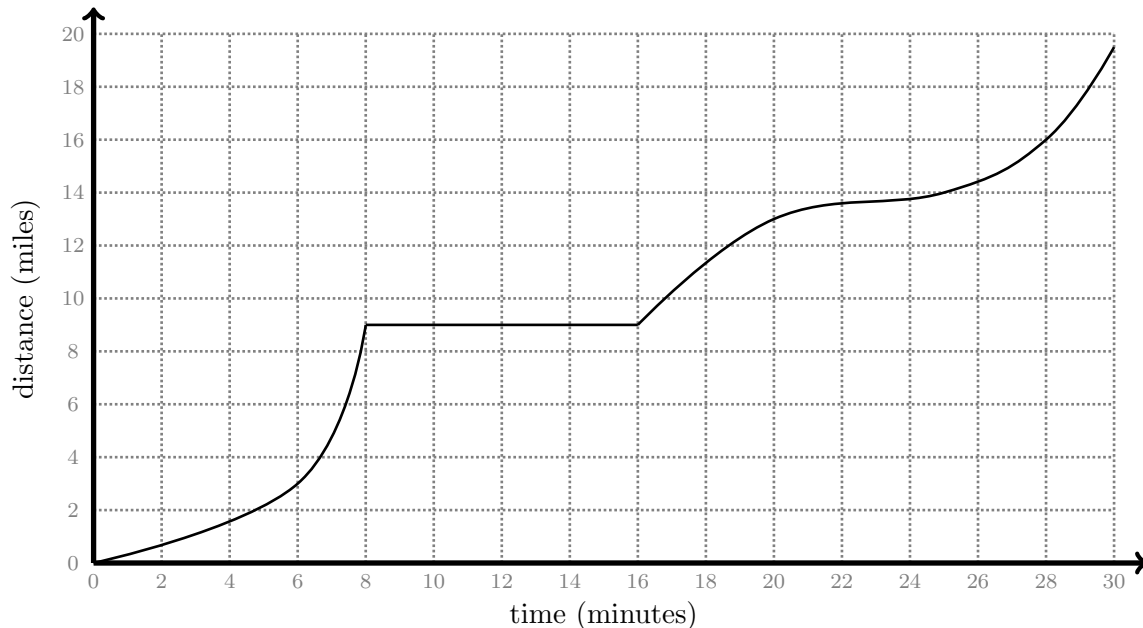
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1	12	
2	12	
3	15	
4	14	
5	9	
6	14	
7	14	
8	10	
Total	100	

- This exam consists of this cover sheet followed by 8 problems on 8 pages. Please check that you have a complete exam.
- You are allowed to use a scientific, non-graphing, non-programmable calculator and one sheet of hand-written notes during this exam. The use of all other sources is prohibited.
- Turn your cell phone OFF and put it away for the duration of the exam.
- You may not listen to headphones or earbuds during the exam.
- Unless otherwise indicated, you must show your work or write a few words to justify your answers. Clearly show all calculations. The correct answer with no supporting work may result in no credit.
- On problems that require you to work with a graph, show your work clearly by marking all lines and points that you use.
- If you use a guess-and-check method when an algebraic method is available, you may not receive full credit.
- Unless otherwise specified, you may round your **final answer** to two digits after the decimal.

GOOD LUCK!

1. (12 points) A car travels down a road for 30 minutes. Its distance over time is plotted in the graph below. Use the graph to answer the following questions, and carefully show your work on the graph or in the space provided below each question.



- (a) What is the average speed of the car over the interval from $t = 8$ minutes to $t = 30$ minutes?

ANSWER: _____ miles per minute

- (b) Name *two different times* when the average trip speed of the car is equal to 0.75 miles per minute.

ANSWER: (list two) _____ minutes

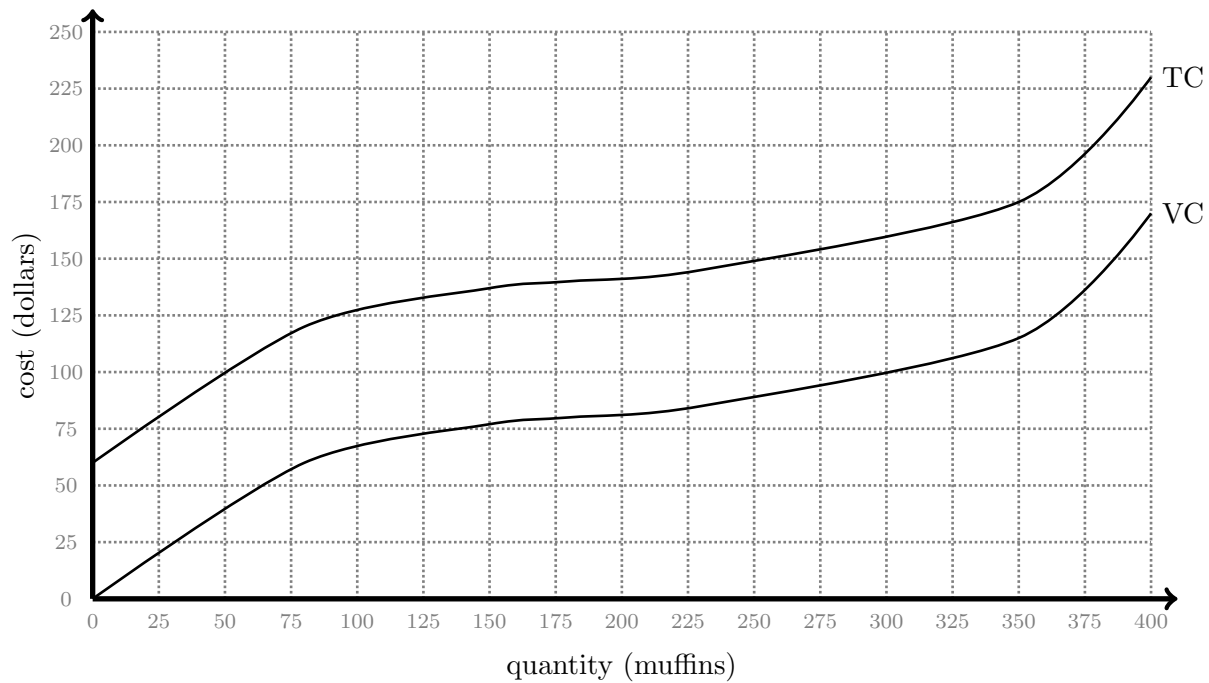
- (c) Find a 2-minute interval starting *after* $t = 16$ minutes when the car's average speed is 0.4 miles per minute.

ANSWER: from _____ to _____ minutes

- (d) At what point during the trip is the average trip speed of the car *greatest*?

ANSWER: at $t =$ _____ minutes

2. (12 points) You sell muffins. The total costs and variable costs of producing and selling q muffins are shown in the following graph:



- (a) Compute the breakeven price.

ANSWER: _____ dollars per muffin

- (b) Compute the average variable cost of producing 200 muffins.

ANSWER: _____ dollars per muffin

- (c) Find a q such that the average cost of producing q muffins is \$1.25.

ANSWER: $q =$ _____ muffins

- (d) Suppose you sell muffins for \$0.70 each. What is the maximum possible profit?

ANSWER: _____ dollars

3. (15 points) Suppose the total cost of producing q Dweezils is given by the formula

$$TC(q) = 0.02q^3 - 2.8q^2 + 99.3q + 500.$$

- (a) Give formulas for each of the following. You don't need to show your work.

- i. Fixed cost.

$$FC =$$

- ii. Variable cost.

$$VC(q) =$$

- iii. Average cost.

$$AC(q) =$$

- iv. Average variable cost.

$$AVC(q) =$$

- (b) Compute the marginal cost at $q = 150$ Dweezils.

ANSWER: _____ dollars per Dweezil

- (c) Compute the shutdown price.

ANSWER: _____ dollars per Dweezil

4. (14 points) A group of space-retailers will buy 70 moon-units from a galactic wholesaler if the price is \$682 per moon-unit, and will buy 325 moon-units if the price is \$274. Meanwhile, the wholesaler will supply 95 moon-units if the price is \$426, and 230 moon-units if the price is \$858.

Assume both the demand and supply curves are linear.

- (a) Find an equation for the demand curve. (Write your answer in the form $p = mq + b$.)

ANSWER: _____

- (b) Find an equation for the supply curve. (Write your answer in the form $p = mq + b$.)

ANSWER: _____

- (c) Find the equilibrium point.

ANSWER: $(q, p) =$ _____

5. (9 points) Gary can sell two types of granola, and is deciding how many of each type to ship to some local stores.

A package of Gary's Exquisite Granola weighs 3 pounds, and sells for a profit of \$3.50.

A package of Gary's Yogurty Granola weighs 4 pounds, and sells for a profit of \$5.00.

Each shipment can hold up to 500 total pounds of granola.

Also, each shipment must include at least 50 packages of the popular Yogurty Granola.

How many of each type should Gary include in a shipment to maximize his profit? Use the method of linear programming and show all your work.

ANSWER: _____ packages of Exquisite and _____ packages of Yogurty

6. (14 points) You make and sell marionettes. The marginal cost and the average cost for producing marionettes are given by the following functions, where q is the number of marionettes and MC and AC are in dollars per marionette.

$$MC(q) = 0.012q^2 - 0.84q + 16.7 \qquad AC(q) = 0.004q^2 - 0.42q + 16.7 + \frac{20}{q}$$

- (a) Find the variable cost of producing 25 marionettes.

ANSWER: _____ dollars

- (b) At what quantities does the average variable cost equal \$12.90 per marionette?

ANSWER: (list all) $q =$ _____ marionettes

- (c) If you sell each marionette for \$26.30, what is your maximum profit?

ANSWER: _____ dollars

7. (14 points) You have \$25,000 to invest for 3 years. Which of the following options would you prefer and why?

Option A: 4.8% annual interest compounded monthly for 3 years.

Option B: 4.6% annual interest compounded continuously for 3 years.

Option C: First, you deposit your money in an account with 4.7% annual interest compounded quarterly for one year and then take what you have at the end of the year and deposit in another account for the next two years in an account with 5% simple interest.

8. (10 points) You start saving money for a trip to Mexico when you finish college by putting away \$75 at the beginning of every month for 4 years in an account with 6% annual interest compounded monthly.

(a) How much money do you have for your trip at the end of the 4 years?

ANSWER: \$_____

- (b) If instead of Mexico, you want to go to Australia, you figure you would need \$5000. How much should you deposit in the same account at the beginning of each month for 4 years to end up with \$5000?

ANSWER: \$_____