

MATH 111  
Exam I  
October 29, 2009

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.”

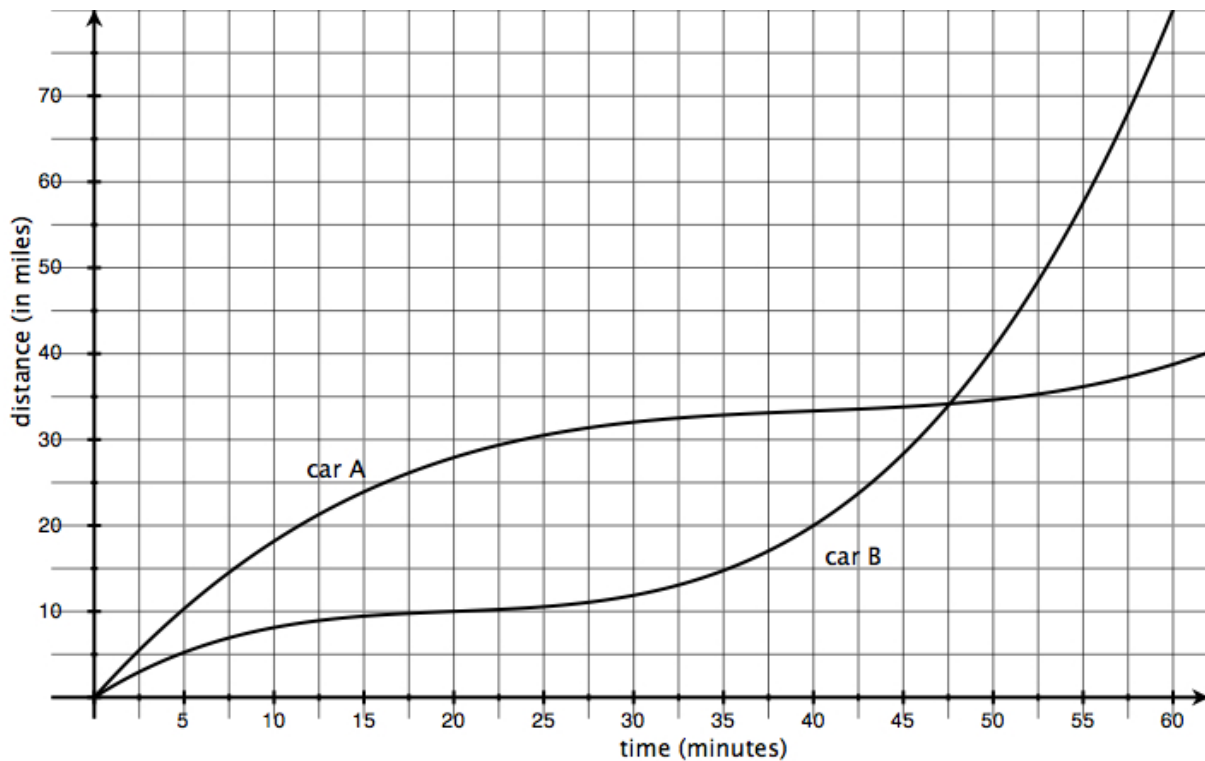
SIGNATURE: \_\_\_\_\_

1	22	
2	15	
3	13	
Total	50	

- Please check that your exam contains 3 problems.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. Clearly label lines and points that you are using and show all calculations. The correct answer with no supporting work may result in no credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (22 points) Below are the graphs of Distance vs. time for two cars.



- (a) Compute the average speed of car *A* during the 5-minute interval beginning at  $t = 15$ .

ANSWER: \_\_\_\_\_ mpm

- (b) Find a time at which the two cars have the same average trip speed.

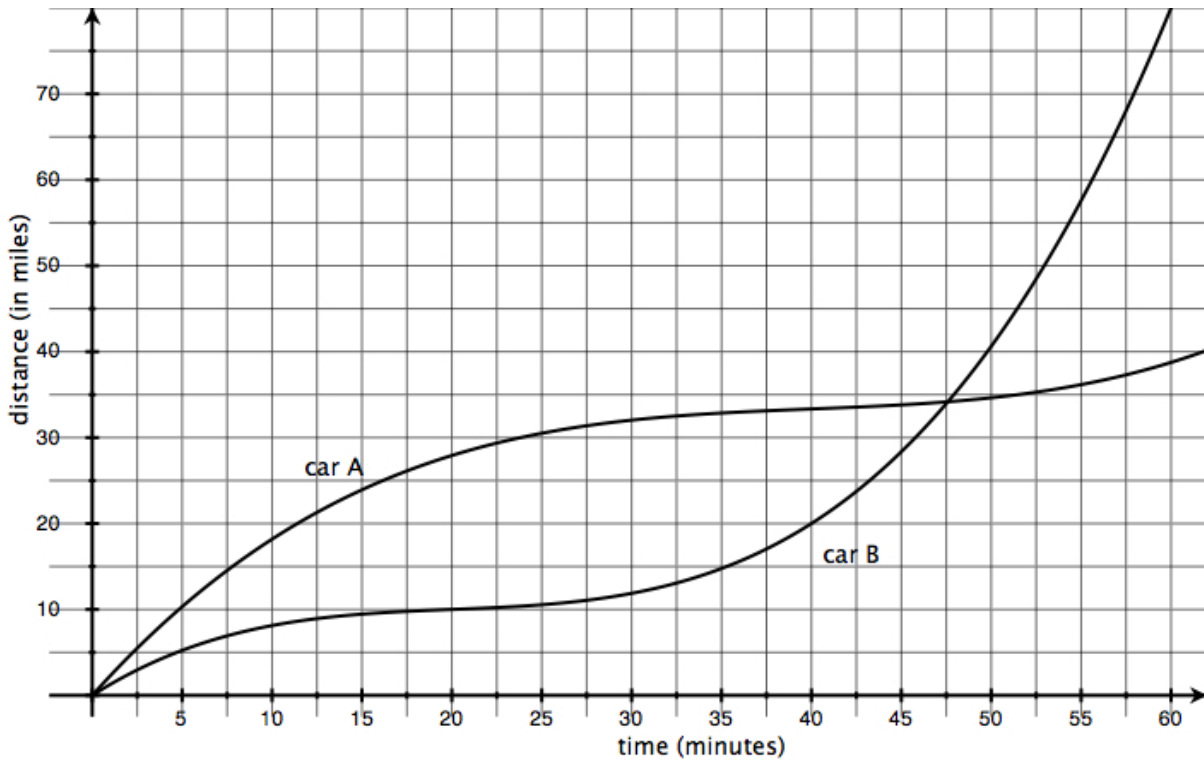
ANSWER:  $t =$  \_\_\_\_\_ minutes

- (c) Find all times at which car *B*'s average trip speed is 0.75 miles per minute.

ANSWER:  $t =$  \_\_\_\_\_ minutes (list all)

(THIS PROBLEM CONTINUES ON THE NEXT PAGE.)

Here are those graphs again.



(d) Find a time after  $t = 20$  at which car  $A$  is 15 miles ahead of car  $B$ .

ANSWER:  $t =$  \_\_\_\_\_ minutes (list all)

(e) Let  $A(t)$  denote car  $A$ 's distance at time  $t$  and  $B(t)$  denote car  $B$ 's distance at time  $t$ .

i. Translate the following statement into functional notation: From  $t = 55$  to  $t = 57.5$ , car  $A$  travels **faster** than car  $B$ .

TRANSLATION:

Is the statement you translated true or false?

ANSWER: (circle one) TRUE      FALSE

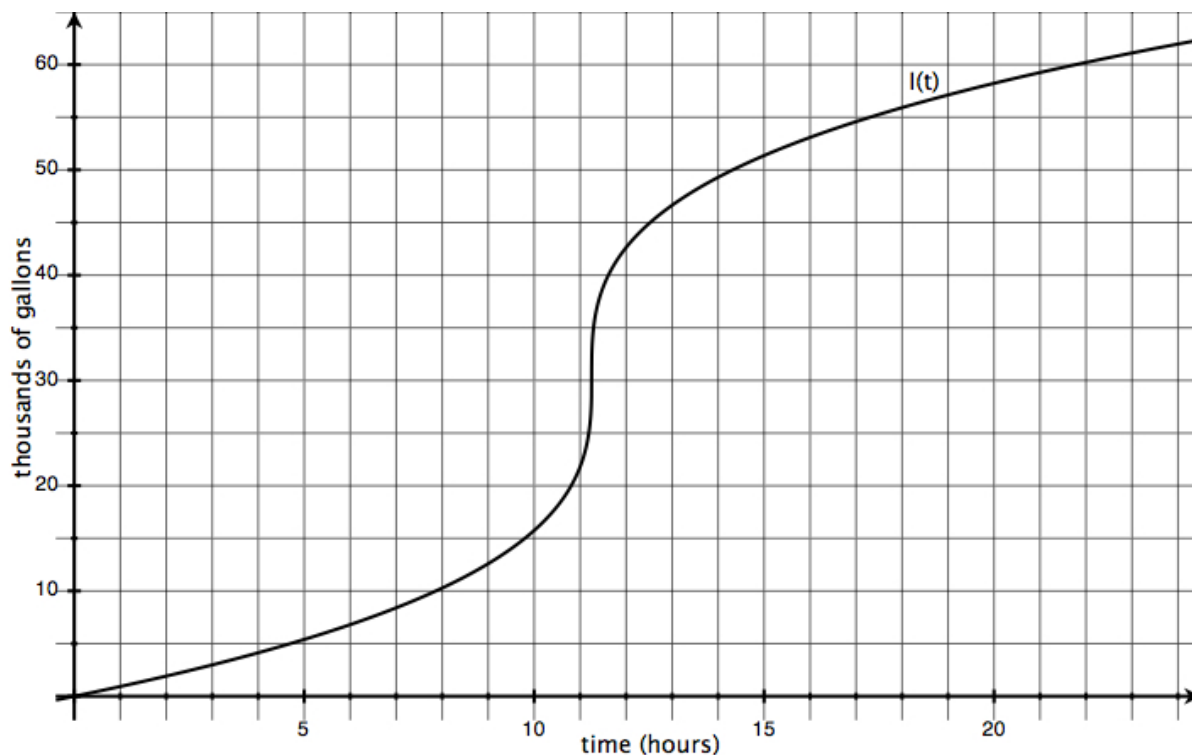
ii. Translate the following statement into functional notation: From  $t = 55$  to  $t = 57.5$ , car  $A$  travels **farther** than car  $B$ .

TRANSLATION:

Is the statement you translated true or false?

ANSWER: (circle one) TRUE      FALSE

2. (15 points) Below is the graph of the amount of water that has flowed **into** a reservoir by various times over a 24-hour period, starting at noon. We abbreviate this amount by  $I(t)$ .



- (a) Water flows **out** of the reservoir at a rate of 3,000 gallons per hour. On the axes above, draw the graph of Water Out vs. time and label your graph  $O(t)$ .
- (b) What is the smallest amount of water we can start with to make sure there is always water available?

ANSWER: \_\_\_\_\_ thousand gallons

- (c) Name a one-minute interval during which the incremental average rate of flow **in** is the same as the rate of flow **out**.

ANSWER: from  $t =$  \_\_\_\_\_ to  $t =$  \_\_\_\_\_

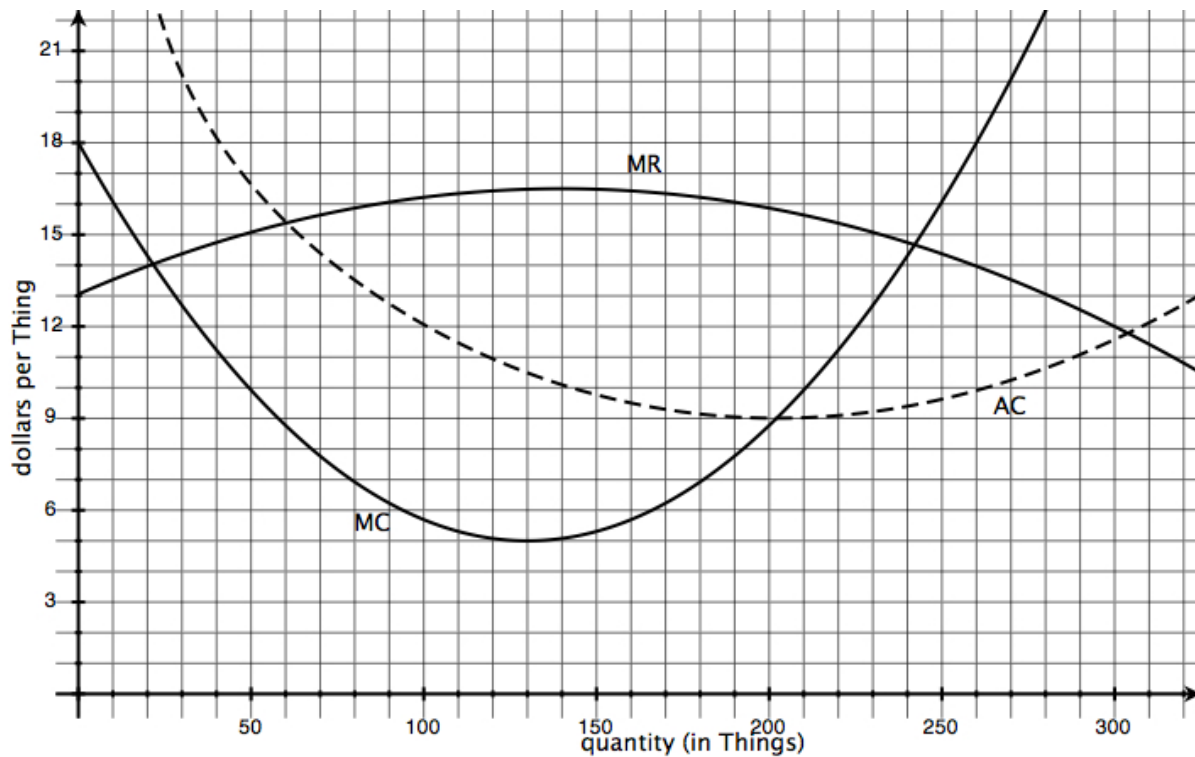
- (d) What is the largest value of  $\frac{I(t)}{t}$ ? (Include units.)

ANSWER: \_\_\_\_\_ UNITS: \_\_\_\_\_

- (e) Suppose the reservoir contains 20,000 gallons at noon ( $t = 0$ ). How much is in the reservoir at  $t = 15$  hours?

ANSWER: \_\_\_\_\_ thousand gallons

3. (13 points) The graphs below show marginal revenue, marginal cost, and average cost for producing Things.



- (a) Find the change in **total revenue** if quantity changes from 170 to 171 Things.

ANSWER: \_\_\_\_\_ dollars

- (b) What quantity will maximize profit?

ANSWER:  $q =$  \_\_\_\_\_ Things

- (c) Find the breakeven price.

ANSWER: \_\_\_\_\_ dollars per Thing

- (d) Fixed costs are \$150. What is the **average variable cost** for producing 50 Things?

ANSWER: \_\_\_\_\_ dollars per Thing