MATH 112
Exam I - Version 1
April 21, 2005

Name ____

Student ID #__________________ Section __________________

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integreity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:__________________________________

1	18	
2	14	
3	18	
Total	50	

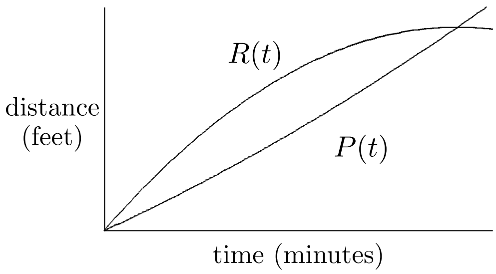
- Please check that your exam contains three problems on four pages.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method when an algebraic method is available, you may not receive full credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (18 points)

To the right are distance versus time graphs for two electronically controlled cars, one red and one purple. The distance formulas for the two cars are:

$R(t) = 5t - \frac{1}{8}t^2$ and $P(t) = \frac{1}{40}t^2 + 2t$.



(a) Find the time at which the purple car's instantantaneous speed is exactly 2.39 feet per minute:

ANSWER: $t =$____________________minutes

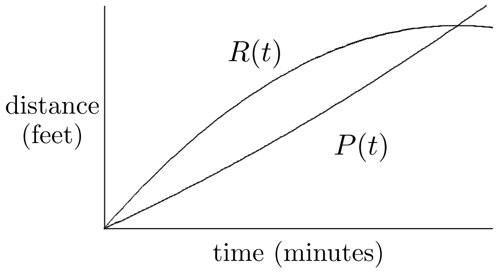
(b) Find the longest interval over which the red car is traveling faster than the purple car.

ANSWER: from $t =$____________________to $t =$____________________minutes

(This problem is continued on the next page.)

Once again, the distance functions for the two cars are:

$R(t) = 5t - \frac{1}{8}t^2$ and $P(t) = \frac{1}{40}t^2 + 2t$.



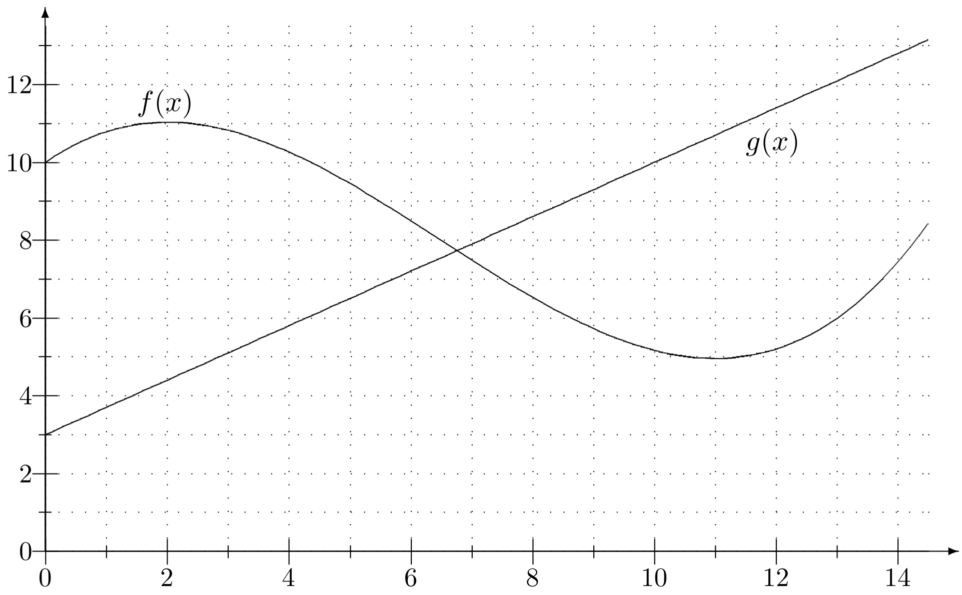
(c) Find a time at which the red car is exactly 16 feet ahead of the purple car OR explain why there is no such time.

ANSWER: $t =$ ____________________ minutes

(d) Give a formula in terms of m for the red car's average speed over the 2-minute interval starting at $t = m$. Write your answer in the form $(\quad) + (\quad)m$.

ANSWER: average speed = ____

2. (14 points) The graph below shows two functions $f(x)$ and $g(x)$.



(a) Name all values of x at which $f'(x) = g'(x)$.

ANSWER: $x =$ ____________________

(b) Give the longest interval over which the derived graph of $f(x)$ is negative and increasing.

ANSWER: from $t =$ ____________________ to $t =$ ____________________

(c) Find a value of h such that $\dfrac{f(11+h) - f(11)}{h} = \dfrac{1}{2}$.

ANSWER: $h =$ ____________________

(d) Compute $f'(4)$.

ANSWER: $f'(4) =$ ____________________

(e) Sketch the graph of $g'(x)$ below. Label your axes clearly.

3. (18 points) You sell Things. The total revenue for selling q thousand Things is given by the formula

$$TR(q) = 12q - 0.6q^2.$$

You don't know the formula for total cost, but you do know that, if quantity increases from q_1 to q_2 thousand Things, then the *change* in total cost will be

$$TC(q_2) - TC(q_1) = [0.1(q_1 + q_2) + 3]\,(q_2 - q_1).$$

Both TR and TC are measured in thousands of dollars.

(a) Recall that marginal revenue is the derivative of total revenue: $MR(q) = TR'(q)$. Use the derivative rules to find the formula for marginal revenue at q thousand Things.

ANSWER: MR(q)=____________________

(b) The total cost to produce 10 thousand Things is 15.5 thousand dollars. What is the total cost to produce 7 thousand Things?

ANSWER: ____________________thousand dollars

(c) Compute $\dfrac{TC(6.002) - TC(6)}{0.002}$.

ANSWER: ____________________

(d) Recall that marginal cost is the derivative of total cost: $MC(q) = TC'(q)$. Find a formula for marginal cost at q thousand Things.

ANSWER: $MC(q) =$____________________

(e) Find the quantity that will yield maximum profit.

ANSWER: $q =$____________________thousand Things