

MATH 112
Exam I
January 30, 2007

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	12	
2	10	
3	12	
4	16	
Total	50	

- Your exam should consist of 4 problems. Check that you have a complete exam.
- 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.
- Unless otherwise indicated, you may round your FINAL ANSWER to two digits after the decimal.
- 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. (12 points)

- (a) Find $\frac{dr}{dt}$ if $r = t^4 \left(1 - t^2 + \frac{1}{t^3}\right)$. (You need not simplify your answer.)

ANSWER: $\frac{dr}{dt} =$ _____

- (b) Find $h'(x)$ if $h(x) = \sqrt[5]{x} - \frac{4}{3x^{3/2}} + 9$. (You need not simplify your answer.)

ANSWER: $h'(x) =$ _____

- (c) Find the quantity that maximizes profit if:

$$TR(q) = -5q^2 + 80q \text{ and } TC(q) = q^3 - 12q^2 + 60q + 60.$$

ANSWER: $q =$ _____

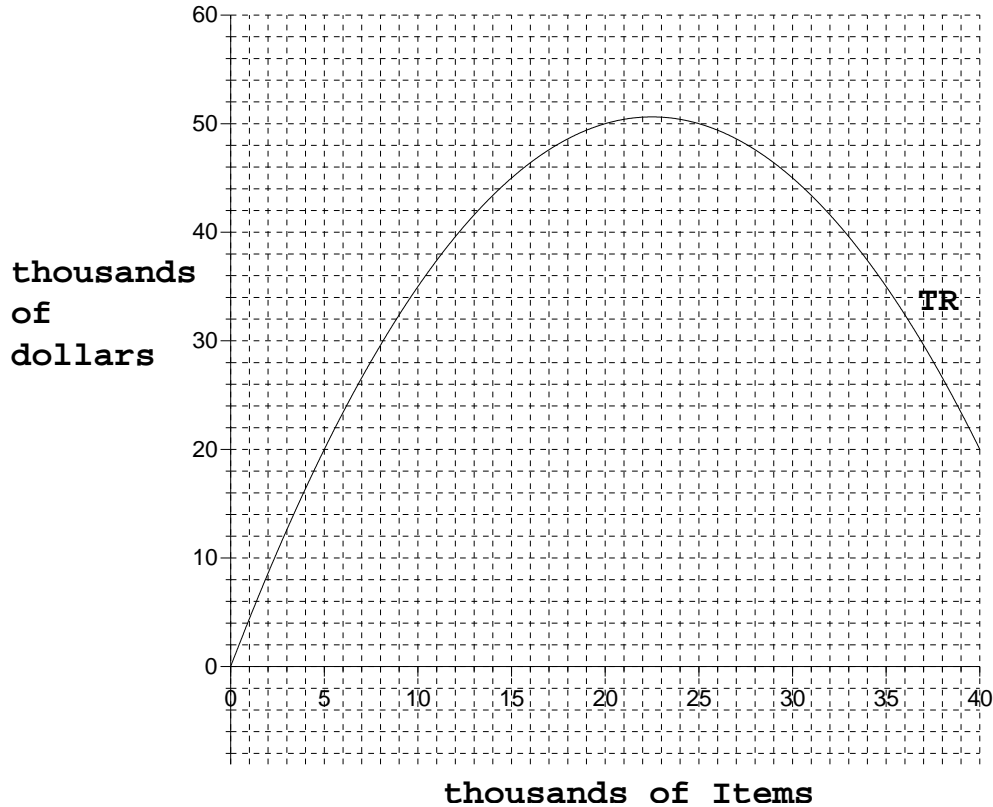
- (d) The distance formulas for two moving objects are given by:

$$A(t) = -\frac{1}{2}t^2 + 25t \text{ and } B(t) = \frac{1}{5}t^2 + 2t,$$

where t is measured in seconds and distance is in inches. Which object, A or B , is moving faster at $t = 10$ seconds?

ANSWER: Object (circle one) A B is moving faster at $t = 10$.

2. (10 points) You manufacture and sell *Items*. The graph of total revenue is given below.



- (a) Find the marginal revenue for manufacturing 5 thousand Items. Include units in your answer.

ANSWER: $MR(5) =$ _____
(don't forget the units!)

- (b) Give a range of values of q over which total revenue is increasing and marginal revenue is negative. If no such interval exists, explain why.

ANSWER: Select one of the following.

_____ Such an interval exists and it is from $q =$ _____ to $q =$ _____.

_____ No such interval exists because:

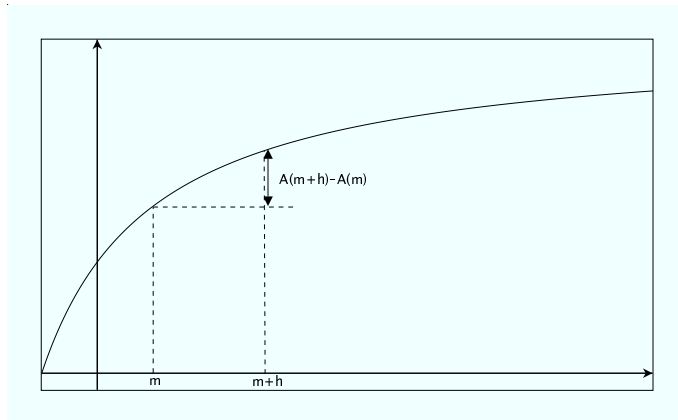
- (c) You have 12 thousand dollars in fixed costs and each Item costs you \$1 to make. Sketch the graph of total cost on the axes above and find the quantity q at which the marginal revenue and marginal cost graphs cross.

ANSWER: $q =$ _____ thousand Items

3. (12 points)

To the right is the graph of $A(t)$, the amount of water (in gallons) that has flowed into a tank by a time t hours after noon. We do not know the formula for $A(t)$, but we do know the following:

$$A(m+h) - A(m) = \frac{40h}{(2m+2h+3)(2m+3)}.$$



(a) Find the average rate of flow into the tank from $t = 1$ to $t = 6$.

ANSWER: _____ gallons per hour

(b) Find the formula for $A'(t)$.

ANSWER: $A'(t) =$ _____

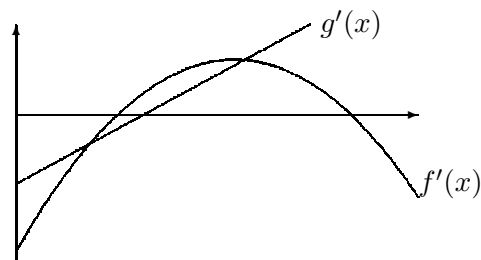
(c) Find the time at which the instantaneous rate of flow into the tank is exactly 4 gallons per hour.

ANSWER: $t =$ _____ hours

4. (16 points)

To the right are the derived graphs of two functions $f(x)$ and $g(x)$. The formulas for $f(x)$ and $g(x)$ are unknown, but the formulas for their derivatives are

$$f'(x) = -x^2 + 13x - 30 \text{ and } g'(x) = 4x - 15.$$



(a) Find all value(s) of x at which the graph of $g(x)$ has a horizontal tangent line.

ANSWER: $x =$ _____

(b) Find all value(s) of x at which the graph of $f(x)$ has a horizontal tangent line.

ANSWER: $x =$ _____

(c) Find the value of x between $x = 4$ and $x = 10$ where the graph of $g(x)$ is lowest. (As always, you must show some work or explain how you arrive at your answer.)

ANSWER: $x =$ _____

(d) Suppose the graphs of $f(x)$ and $g(x)$ cross at $x = 3.75$. Find the value of x , greater than 3.75, at which the graphs of $f(x)$ and $g(x)$ are farthest apart.

ANSWER: $x =$ _____