

MATH 111
Exam II
November 13, 2008

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	14	
2	20	
3	16	
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. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method or read a value from a graph on your calculator when an algebraic method is available, you may not receive full credit.
- There are multiple versions of the exam. Save yourself the hassle of a hearing before the Faculty Council on Academic Conduct: do not cheat.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (14 points) You produce and sell Trimbles. Your total revenue and total cost (both in dollars) for selling q Trimbles are:

$$TR(q) = -0.14q^2 + 14q \quad TC(q) = 0.01q^3 - 0.75q^2 + 19.75q + 25.$$

- (a) Use the fact that $MR(q) = TR(q+1) - TR(q)$ to write out a formula for $MR(q)$ in terms of q and simplify as much as possible.

ANSWER: $MR(q) =$ _____

- (b) Set up the equation that you would solve in order to answer the question:

At what quantity does total revenue exceed total cost by 60 dollars?

Simplify your equation so that is in the form: $Aq^3 + Bq^2 + Cq + D = 0$.

DO NOT SOLVE THE EQUATION.

ANSWER: _____

- (c) Use the fact that the shutdown price is the smallest value of average variable cost to find the shutdown price.

ANSWER: \$ _____ per Trimble

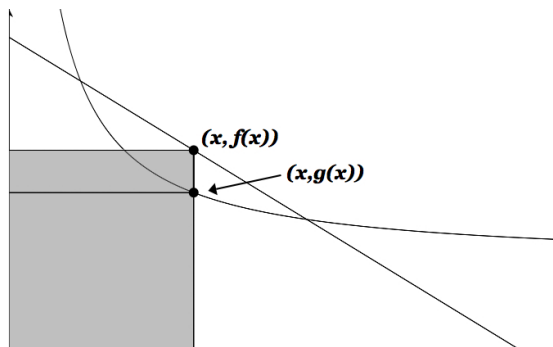
2. (20 points)

Let $f(x) = -2x + 11$ and $g(x) = \frac{5}{x} + 3$. The graphs of $f(x)$ and $g(x)$ are shown at right.

We define two new functions:

$A(x) =$ area of rectangle with one corner at $(x, f(x))$

$B(x) =$ area of rectangle with one corner at $(x, g(x))$



(a) Write out the formulas for $A(x)$ and $B(x)$.

ANSWER: $A(x) =$ _____
 $B(x) =$ _____

(b) Define the function $C(x)$ by $C(x) = A(x) - B(x)$. Find the largest value of $C(x)$.

ANSWER: _____

(c) Find the longest interval on which $C(x)$ is decreasing and $A(x)$ is increasing.

ANSWER: from $x =$ _____ to $x =$ _____

(d) What is the smallest value of $B(x)$ on the interval from $x = 1$ to $x = 5$?

ANSWER: _____

(e) Find the longest interval on which $A(x)$ is at least 12.

ANSWER: from $x =$ _____ to $x =$ _____

3. (16 points) The marginal cost for producing Frinks is linear. You know that the marginal cost for producing 100 Frinks is \$30.40 and the marginal cost for producing 200 Frinks is \$60.40. You also know that, if $MC(q) = Aq + B$ (q in Frinks, MC in dollars per Frink), then the formula for variable cost is:

$$VC(q) = \frac{A}{2}q^2 + \left(B - \frac{A}{2}\right)q, \quad (q \text{ in Frinks, } VC \text{ in dollars}).$$

- (a) Find the formulas for $MC(q)$ and $VC(q)$.

ANSWER: $MC(q) =$ _____
 $VC(q) =$ _____

The formula for total revenue is $TR(q) = 45.40q$ (q in Frinks, TR in dollars) and fixed costs are \$3000.

- (b) What whole number quantity maximizes profit?

ANSWER: $q =$ _____ Frinks

- (c) What is the largest profit you can earn selling a whole number of Frinks?

ANSWER: \$ _____

- (d) Find the largest quantity at which average cost is \$64.50 per Frink.

ANSWER: $q =$ _____ Frinks