Math 111 Exam 2
August 2, 2011

Name _____

Honor Statement

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

Signature _____

1	16
2	11
3	16
4	7
total	50

- Your test should have 4 problems on 4 pages (not including this one). Make sure that it does!
- If you can't solve part (a) of a problem, but need the answer to solve part (b), then write down *how* you would solve (b) if you did know the answer for (a).
- Cell phones and any electronic items that aren't calculators must be turned off and put away.
- **Important:** Always show your algebra steps, unless the problem says not to. Otherwise, you may not receive credit, even if your answer is correct. If you use your calculator to do the quadratic formula, you must indicate this.
- The good news: all problems can be solved algebraically.
- The bad news: as a result, you will not receive full credit for guess-and-check or for approximating your answers from a graph.
- You're allowed:
  - one double-sided $8\frac{1}{2}'' \times 11''$ sheet of notes
  - a calculator
- Raise your hand if you have a question or can't understand a problem.

1. You just found a new favorite hobby: selling scarves on hot summer days. Your total cost for producing q scarves is

$$TC(q) = 0.5q^2 + 2q + 6$$

(a) Find formulas for average cost and average variable cost.
Simplify as much as possible.

$AC(q) =$ _____

$AVC(q) =$ _____

(b) If you sell q scarves, your price per scarf is $p(q) = -0.5q + 20$.
Find the formula for *total revenue*.

$TR(q) =$ _____

(c) What is the maximum profit?

max profit $=$ _____

(d) Find the formula for MC (marginal cost), simplifying it as much as possible.
(Remember $MC(q) = TC(q+1) - TC(q)$.)

$MC(q) =$ _____

2. You produce and sell rye bread. Your marginal revenue and marginal cost for selling q hundred loaves are as follows:

$$MR(q) = 5$$
$$MC(q) = 3q^2 - 2q + 1$$

(a) Using only the information given above, is it possible to find the fixed cost? Explain why or why not.

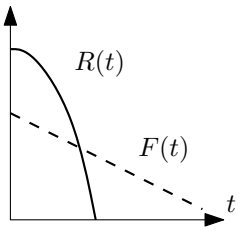
(b) At what quantity q is profit greatest? (pay attention to units)

maximum profit is at $q =$ _____

(c) Suppose $AVC(q) = q^2 - q + 1$. Find the shutdown price.

SDP $=$ _____

3. A rock and feather are falling. The height of the *rock* (in feet) after t seconds has the formula



$$R(t) = 64 - 16t^2.$$

We know:

- The feather is 40 feet high at $t = 0$.
- The rock and feather are at the same height at $t = 1.5$ seconds.

(a) At what time does the rock hit the ground?

at $t =$ _____

(b) Find the formula for $F(t)$, the height of the feather after t seconds.

$F(t) =$ _____

NOTE: You will need the equation of $F(t)$ later. If you couldn't solve part (b), use $F(t) = 20 - 5t$ as your equation. (This is not the correct answer for (b).)

(c) At what time is $R(t) - F(t)$ the largest? (*Hint*: it's not $t = 0$.)

at $t =$ _____

(d) Find a formula for the average speed of the rock over a $\frac{1}{2}$-second interval starting at time t. Simplify as much as possible.

average speed: _____

4. While analyzing a business, you come up with two quadratic functions, $f(x)$ and $g(x)$. Their formulas are:

$$f(x) = x^2 - 2x - 2$$
$$g(x) = -x^2 + 8x + 3$$

(a) Find the longest interval where both $f(x)$ and $g(x)$ are increasing.

from $x =$ _____ to $x =$ _____

(b) Is there a value of x at which $f(x)$ and $g(x)$ are both decreasing?
Carefully explain your answer.