NAME: ________________________________ Student ID #: _________________

QUIZ SECTION:______

Math 112 A
Midterm II
May 15, 2007

Problem 1	15	
Problem 2	15	
Problem 3	20	
Total:	**50**	

- You are allowed to use a calculator, a ruler, and one sheet of notes.
- Your exam should contain 5 pages in total and 3 problems.
  Make sure you have a complete test.
- Unless otherwise noted, you **must show how you get your answers**.
  Correct (or incorrect) answers with no supporting work may result in little or no credit.
- If an algebraic method is available, answers obtained by guessing, approximating, using your graphing calculator, or plug-and-check will get little or no credit.
- Write your **final answer in the indicated spaces**. Unless otherwise noted, round your answer to two decimal digits.
- If you need more room, use the backs of pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

GOOD LUCK!

Do you want me to post your grade so far on the class website under the last 4 digits of your STUDENT ID (in about a week)?

☐ *Yes, please post my grade. Sign to give permission:* ______________________________

☐ *No, please don't post my grade so far.*

1) (15 points) Evaluate the indicated derivatives of the following functions. **Do not simplify**.

a) $f(x) = (x^2 + 2x + 5 + \frac{1}{x})(x^3 + e^x)$

$f'(x) =$

b) $h(z) = \ln(\sqrt{z+4})$

$h'(z) =$

c) $y = \frac{t^5 e^t}{-t^2 + 5}$

$\frac{dy}{dt} =$

2. (15 points) Consider the function $f(x,y) = -3x^2 + 6xy - y^3 + 5$.

a) Write out the two partial derivatives, $f_x(x,y)$ and $f_y(x,y)$. You need not show work, but do work carefully!

$f_x(x,y) =$ ________________________________

$f_y(x,y) =$ ________________________________

b) Find **all** values of (x,y) that are candidates for local maxima or local minima.

Answer: (x,y)=__________________________(*list all*)

c) Use partial derivatives to estimate the value of: $\dfrac{f(1.0001,0)-f(1,0)}{0.0001}$.

Answer: $\dfrac{f(1.0001,0)-f(1,0)}{0.0001} \approx$ __________

3. (20 points)

You sell Things.

The demand curve is given by the following formula: to sell q thousand Things, you have to sell them at a **price** of $\boldsymbol{p(q) = q^2 - 22q + 121}$ dollars per Thing.

Thus, your Total Revenue is given by $\boldsymbol{TR} = pq = \boldsymbol{q^3 - 22q^2 + 121q}$ (in thousands of dollars.)

a) List all quantities q for which your demand curve make sense (i.e, the price p is decreasing and is not negative).

Answer: from q=_______ to q=_________ thousand Things.

(Recall that q is in thousands so q=1 means 1000 Things.)

b) Find all the critical numbers for your Total Revenue function.

Answer: TR has critical numbers at q= ________________________________.

<This problem continues on the next page.>

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Recall: to sell *q* thousand Things, your price per Thing is $\boldsymbol{p(q) = q^2 - 22q + 121}$ dollars,

and your Total Revenue is: $\boldsymbol{TR(q) = q^3 - 22q^2 + 121q}$ thousands of dollars

c) Use the Second Derivative Test to determine whether each of the critical numbers you found in part (b) is a local maximum or a local minimum. Show all work and circle your answers.

d) Suppose you sell quantities between 1,000 and 10,000 Things (so *q* is between 1 and 10). What is the price per Thing that you must charge in order to maximize your Total Revenue?

Answer: To maximize your TR, you should charge p=______________ dollars per Thing.