NAME: ________________________________ Student ID #: _________________

QUIZ SECTION:______

Math 112 C
Midterm II
February 28, 2008

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, you may round your final 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 grades.*

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

a) $f(x) = \left(1 + e^x + \sqrt{x}\right)(1 + x^3)$

$f'(x) =$

b) $z = \frac{xe^x}{3x+1}$

$\frac{dz}{dx} =$

c) $g(t) = \sqrt{1 + \ln(3t^2)}$

$g'(t) =$

2. (15 Points) You produce and sell plasma TV's and Computer Monitors.

(a) (3 pts) Suppose you sell each TV for $3000 and each Monitor for $400. Give a formula for the total revenue $R(x, y)$, in dollars, which results from selling x TV's and y Monitors.

ANSWER: $R(x, y) =$ ________________________________

(b) Suppose your profit from selling x TV's and y Monitors is given by the function:

$$P(x, y) = 0.2x^2 + 0.1\,y^2 - 0.3xy + 800x + 200y - 1000$$

i. (4 pts) Compute the two partial derivatives of your Profit function.

$P_x(x, y) =$ ________________________________

$P_y(x, y) =$ ________________________________

ii. (5 pts) Find all candidates (x, y) for local minima or maxima of $P(x, y)$.

Answer: $(x, y) =$ ________________________________

iii. (3 pts) Suppose you've sold 150 TV's and 350 Monitors. Use a partial derivative to estimate the increase in your profit if you sell one more TV.

Answer: Profit will change by about $ ________________

3. (20 points)

The **Marginal Cost**, in dollars, for producing q thousand Items is given by the function:

$$MC(q) = \frac{1}{20}\mathrm{q}^3 - 0.6\mathrm{q}^2 + 2q + 12$$

a) (5 pts) Find all quantities where the Marginal Cost function has a horizontal tangent.
Round your answer(s) to the nearest two decimal digits.

Answer: $MC(q)$ has horizontal tangents at q =__________________________ (*list all*)

b) (6 pts) What is the lowest value of the Marginal Cost on the interval from $q = 0$ to $q = 4$ thousand Items?
Show your steps.

Answer: Lowest MC is $__________________

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Recall that the **Marginal Cost** for producing q thousand Items is given by the function:

$$MC(q) = \frac{1}{20}q^3 - 0.6q^2 + 2q + 12$$

c) (5 pts) Apply the Second Derivative Test to each value you found in part (a). State clearly what the results of your test tell you about the Marginal Cost function at these specific points, and circle your answers.

d) (4 pts) Is the graph of the <u>**Total Cost**</u> concave up or concave down at the point $q = 10$? Justify your answer.

Answer: $TC(q)$ is concave ___________ at $q = 10$.