

NAME: _____

Student ID #: _____

QUIZ SECTION: _____

Math 112 A
Midterm II
February 25, 2010

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Total:	50	

- You are allowed to use a calculator, a ruler, and one sheet of notes.
- Other than this cover page, your exam should contain 5 problems of 4 pages. 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, 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 grader that you have done so.
- Raise your hand if you have a question.

GOOD LUCK!

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

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

$$f'(x) =$$

b) $z = \left(1 + ye^y + \frac{1}{y^2}\right)^8$

$$\frac{dz}{dy} =$$

c) $g(t) = \frac{\ln(t^2 - t + 1)}{3t + 5}$

$$g'(t) =$$

2 (8 points)

a) Suppose $g(x, y) = 3x^2 - 5x + 2x^2y - xy^2 + y^3 + 7$. Compute the following partial derivative:

$$g_x(x, y) =$$

b) Suppose

$$z = \frac{3y}{x^2 + 1} - xe^y + 2y \ln y.$$

Compute the following partial derivative:

$$\frac{\partial z}{\partial y} =$$

3 (5 points) You do **not** know the formula for a certain multi-variable function $f(x, y)$, but you are told that its two partial derivatives are:

$$f_x(x, y) = 2xy + 2y - 5$$

$$f_y(x, y) = x^2 + y - 4$$

Compute or approximate each of the following three values.

$$A = \frac{f(1, 3.0001) - f(1, 3)}{0.0001}$$

$$B = \frac{f(2.001, 3) - f(2, 3)}{0.001}$$

$C =$ the slope of the tangent line to the graph of $h(x) = f(x, 2)$ at $x = 5$

ANSWER: $A \cong$ _____, $B \cong$ _____, $C =$ _____

4 (13 points) Consider the function $f(t) = t^3 + 3t^2 - 9t + 700$.

a) (2 pts) Compute all values of t at which the graph of $f(t)$ has a horizontal tangent line.

ANSWER: $t =$ _____ (list all)

b) (4 pts) For each of the points you found in part (a), use the second derivative test to determine whether it is a local minimum or local maximum. Show your work and circle your answers.

c) (i) (2 pts) Is the graph of $f(t)$ concave up or concave-down at $t = 7$? Justify.

ANSWER: It's concave-_____

BECAUSE: _____

(ii) (2 pts) Is the point $t = 7$ a local minimum, local maximum, or neither for the function $f(t)$? Justify.

ANSWER (**circle one**): local minimum; local maximum; neither.

BECAUSE: _____

d) (3 pts) Determine the **maximum value** of $f(t)$ on the interval from $t = -3$ to $t = 10$. Show work.

ANSWER: Max value of $f(t)$ on the given interval is _____.

5 (9 points) You run a home-business, knitting and selling mittens and socks.

Each pair of mittens takes you 4 hours of work and 0.75 spools of wool to knit, and it sells for \$20.

Each pair of socks takes you 2.5 hours and 1 spool of wool to knit, and it sells for \$12.

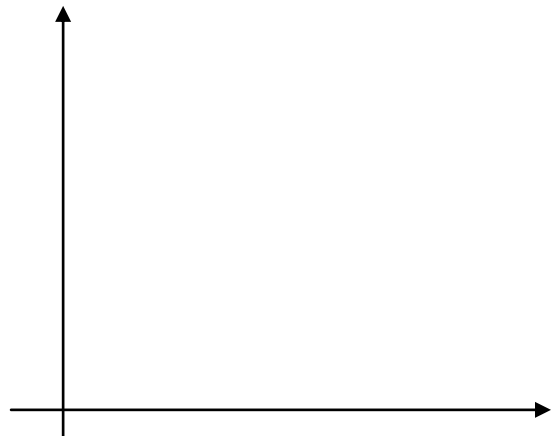
This week you have at most 40 hours to spend knitting and a supply of 15 spools of wool.

Let x be the number of pairs of mittens you produce this week, and y be the number of pairs of socks.

a) (2 pts) Write down the formula for the function $R(x, y)$ that computes the total revenue you would earn from selling x pairs of mittens and y pairs of socks.

$$R(x, y) = \underline{\hspace{10cm}}$$

b) (5 pts) Draw your feasible region, label it "FR", and compute all its vertices.
(list both coordinates -- you may round them to 2 decimal digits)



Vertices (list all): $(x, y) = \underline{\hspace{10cm}}$

c) (2 pts) Find your maximum possible total revenue this week. Show work.

Max possible revenue is \$.