

MATH 112
Exam II - Version 1
February 24, 2005

Name _____

Student ID # _____

Section _____

1	16	
2	10	
3	12	
4	12	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains four 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 when an algebraic method is available, you may not receive full credit. If you read values from a graph on your calculator, you may not receive full credit.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (16 points) Find the indicated derivative. Do not simplify.

(a) $f(t) = (t^4 - 4t^3 + 2t)(t^5 + 6t^4 + 9t^2)$

$$f'(t) =$$

(b) $R(q) = \frac{\ln(q^2 - 4q)}{1 + 4e^q}$

$$R'(q) =$$

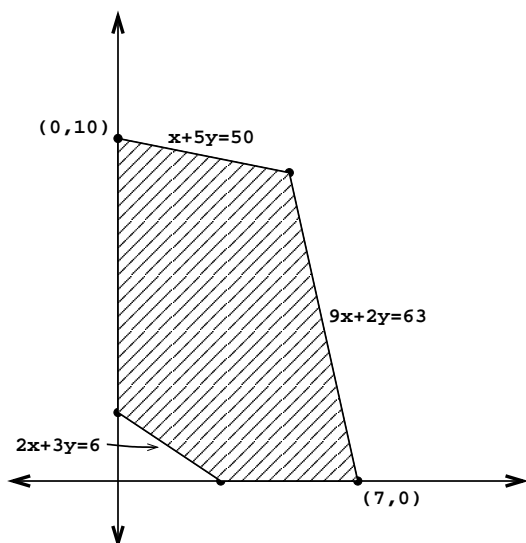
(c) $f(x, y) = x^2e^y + e^{x^2}y + e^{x^2y}$

$$f_x(x, y) =$$

(d) $f(x, y) = x^2e^y + e^{x^2}y + e^{x^2y}$

$$f_y(x, y) =$$

2. (10 points) A linear programming problem has three constraints: $2x + 3y \geq 6$, $x + 5y \leq 50$, and $9x + 2y \leq 63$. The feasible region is the SHADED REGION in the following figure.



Find the maximum and minimum values of the function

$$P(x, y) = 4x + 9y,$$

subject to these constraints.

ANSWER: maximum = _____

minimum = _____

3. (12 points) You sell Things. The formulas for total revenue and total cost are given by:

$$TR(q) = -0.08q^2 + 2.35q \quad TC(q) = 0.01q^3 - 0.3q^2 + 3q + 4,$$

where q is measured in hundreds of Things and TR and TC are in hundreds of dollars.

- (a) Find all values of q at which **marginal cost** (MC) has a horizontal tangent line.

ANSWER: $q =$ _____ hundred Things

- (b) Find the global maximum and global minimum values of **marginal cost** (MC) on the interval:

- i. from $q = 3$ to $q = 8$ hundred Things.

ANSWERS: global maximum = _____ dollars
 global minimum = _____ dollars

- ii. from $q = 8$ to $q = 15$ hundred Things.

ANSWERS: global maximum = _____ dollars
 global minimum = _____ dollars

- (c) Let $P(q)$ be the profit you earn for selling q hundred Things. Use the Second Derivative Test to determine whether $q = 13$ hundred Things gives a local maximum or local minimum value of profit OR explain why the Second Derivative Test does not work in this case.

4. (12 points) Suppose $f(x, y) = \frac{1}{2}x^2 - 5x - \frac{1}{2}y^2 - 4y + 2xy + 10$.

(a) Find all values of (x, y) which are candidates for a local maximum or a local minimum.

ANSWER: $(x, y) =$ _____

(b) Use partial derivatives to tell which of the following numbers is bigger:

$$A = \frac{f(5.00001, 5) - f(5, 5)}{0.00001} \quad B = \frac{f(5, 5.00001) - f(5, 5)}{0.00001}.$$

(As always, show all work.)

ANSWER: (circle one) A B is bigger

(c) Which is steeper?

- i. the graph of the function $h(t) = f(6, t)$ at $t = 1$; OR
- ii. the graph of the function $k(t) = f(t, 2)$ at $t = 5$.

ANSWER: (circle one) i ii is steeper