Math 112 - Spring 2007
Exam 2
May 15, 2007

Name: ____________________

Section: ____________________

Student ID Number: ____________________

1	12	
2	12	
3	14	
4	12	
Total	50	

- You are allowed to use a calculator and one hand-written 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- Check that your exam contains all the problems listed above.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. Unless otherwise indicated, your final answer must be correct to two digits after the decimal.
- If you use a guess-and-check, or calculator, method when an algebraic method is available, you may not receive full credit.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There are multiple versions of the exam. Any student found engaging in academic misconduct will receive a score of 0 on this exam. In addition, students found engaging in academic misconduct are typically put on academic probation. So DONT CHEAT! It could serious hurt your career.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (12 pts) Compute the indicated derivatives and put a box around your final answer. Do not simplify.

(a) (4 pts) $G(w, b) = b^3 m + 4\ln(m) - \dfrac{5}{b^2} - m^3 b^6 + 7m + 14$

$$\frac{\partial G}{\partial b} =$$

$$\frac{\partial G}{\partial m} =$$

(b) (4 pts) $y = \ln\left(e^{3x^5} + \sqrt{3x-2}\right)$

$$\frac{dy}{dx} =$$

(c) (4 pts) $F(x) = \dfrac{(x^2+1)^{12}}{1+\ln(2x+1)}$

$$F'(x) =$$

2. (12 pts) Let $f(x, y) = 4y^2 + 3xy - 24x + 10$.

(a) (4 pts) Compute the partial derivatives $f_x(x, y)$ and $f_y(x, y)$.

ANSWERS:

$f_x(x, y) =$

$f_y(x, y) =$

(b) (4 pts) If we fix y to be 3, then $g(x) = f(x, 3)$ becomes a function of only one variable, the variable x. Find the slope of the tangent line to the one variable function $g(x)$ when $x = 5$ and circle the partial derivative expression that corresponds to this value.

ANSWER: slope = ____________________

ANSWER (circle one): $f_x(5, 3)$ $f_x(5, 5)$ $f_y(5, 3)$ $f_y(5, 5)$

(c) (4 pts) Find all pts (x, y) that are candidates for a local maximum or local minimum of $f(x, y)$.

ANSWER: list of candidates (x, y) = ____________________

3. (14 pts) Your Total Cost (in dollars) *vs.* the quantity q of Items sold is given by the function:

$$TC(q) = \frac{q^3}{3} - 5q^2 + 21q + \frac{55}{2}.$$

The Average Cost is given by $AC(q) = \dfrac{TC(q)}{q}$.

(a) (6 pts) Find the two values of x at which the **Total Cost** graph has a horizontal tangent. Use the Second Derivative Test to determine whether $TC(q)$ reaches a local maximum or a local minimum at each value.

ANSWER: q = ________________ gives a local ________________ of $TC(q)$;

q = ________________ gives a local ________________ of $TC(q)$.

(b) (4 pts) Give the global maximum and global minimum values of **Total Cost** on the interval from $q = 0$ to $q = 5$.

ANSWER: MAX = ____________ dollars; MIN = ____________ dollars.

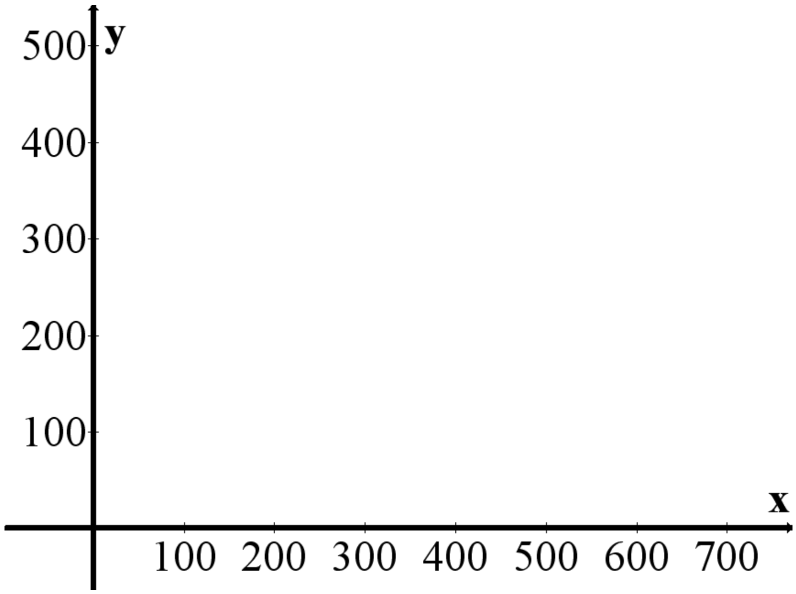
(c) (4 pts) Is the **Average Cost** graph concave up, concave down, or neither at $q = 3$? Justify your answer. Guessing the answer with no supporting work receives zero pts.

ANSWER (circle one): CONCAVE UP CONCAVE DOWN NEITHER

4. (12 pts) The constraints for a linear programming problem are

$$4x + 6y \leq 1800, x \leq 300, \text{ and } y \leq 150.$$

(a) (4 pts) Sketch the feasible region.



(b) (4 pts) Find the exact coordinates of the vertices of the feasible region. Label all of them on your graph.

(c) (4 pts) Subject to the given constraints, find the maximum value of the objective function:

$$f(x, y) = 14x + 20y.$$

ANSWER: maximum = ____________________