Math 112 - Spring 2010
Exam 2
May 18, 2010

Name: _____

Section: _____

Student ID Number: _____

1	14	
2	13	
3	13	
4	10	
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.
- 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. Your TA can only clarify the wording of a question, he/she can in no way comment on your work. So don't raise your hand fishing for answers.
- There are multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board. In such an instance, you will be forced to meet in front of a board of professors to explain your actions.
  DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
  WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
  Keep your eyes down and on your paper. If your TA sees your eyes wandering they will warn you only once before taking your exam from you.
- You have 50 minutes to complete the exam. Use your time wisely: Spend no more than 10 minutes on each page before moving on to the next page (which gives you an extra 10 minutes at the end to check your work).

GOOD LUCK!

1. (14 pts) Compute the indicated derivatives and put a box around your final answer. Do not simplify, leave your answer in expanded form so that we can clearly see the method you used.

   (a) (4 pts) $F(x) = \left(\ln\left(1 + \dfrac{3}{x}\right)\right)^{10}$

   $F'(x) =$

   (b) (4 pts) $y = \sqrt[4]{2x+1} \cdot e^{(2x^4)}$

   $\dfrac{dy}{dx} =$

   (c) (6 pts) The formula for the value of Bob's monthly annuity savings account in one year is $A(x) = \dfrac{3000(1 + \frac{x}{100})^{12} - 3000}{x}$, where x is the monthly percentage interest rate.
   Find the instantaneous rate of change of $A(x)$ at $x = 10$.

ANSWER: $A'(10) =$ _____ dollars/percent

2. (13 pts) Your Total Cost (in hundreds of dollars) and Demand Curve (in dollars) *vs.* the quantity q in hundreds of Items sold is given by the function:

$$TC(q) = \frac{q^3}{12} - \frac{q^2}{2} + \frac{3}{4}q + 10 \quad \text{and} \quad p = h(q) = 24 - 8\sqrt{q}.$$

(a) (7 pts) Write the formula for **Total Revenue**, TR, and give the **prices** that correspond to the global maximum and global minimum value of **Total Revenue** over the interval $q = 2$ to $q = 6$ hundred Items.

ANSWER: **PRICE** for the global minimum value = _____ dollars

PRICE for the global maximum value = _____ dollars

(b) (6 pts) Find **all** critical numbers of **Total Cost**, TC. Then use the second derivative test to determine whether $TC(q)$ reaches a local maximum, local minimum, or tell me if the test is inconclusive. Clearly put a box around your critical numbers and clearly label each as either local max, local min, or test inconclusive.

3. (13 pts) Let $z = f(x, y) = 14x - 12y + 3x^2y$.

(a) (2 pts) Write out the formulas for $f_x(x, y)$ and $f_y(x, y)$.

$f_x(x, y) =$ _____ $f_y(x, y) =$ _____

(b) (4 pts) Find **all** points (x, y) which are candidates for local maxima or local minima.

ANSWERS: $(x, y) =$ _____

(c) (3 pts) Suppose $(x, y) = (4, 0)$. circle the correct answer to complete the statement:
A small increase in x (with y held fixed) leads to a (LARGER SMALLER EQUAL) increase in z than a small increase in y (with x held fixed).
Show appropriate calculations.

ANSWER: (circle one) LARGER SMALLER EQUAL

(d) (4 pts) If $y = -\frac{1}{3}$ is fixed, the function $g(x) = f(x, -\frac{1}{3})$ is a one variable function of x. By showing appropriate calculations, answer the following questions:

i. Is $g(x)$ increasing, decreasing, or neither at $x = 3$?

ANSWER: (circle one) INCREASING DECREASING NEITHER

ii. Is $g(x)$ concave up, concave down, or neither at $x = 3$?

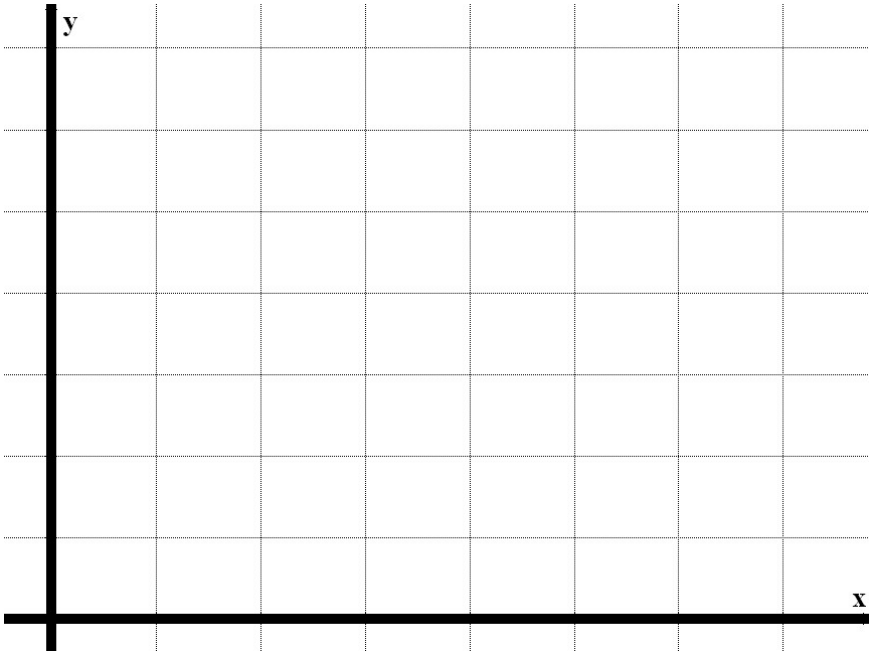
ANSWER: (circle one) CONCAVE UP CONCAVE DOWN NEITHER

4. (10 pts) The constraints for a linear programming problem are

$$4x + 2y \leq 1200,\ y \leq 400,\ \text{and } x \leq 200.$$

and x and y both must be greater than or equal to zero.

(a) (7 pts) Sketch and shade the feasible region and **clearly label the exact coordinates of all vertices**.



(b) (3 pts) Subject to the given constraints, find the maximum and minimum values of the objective function:

$$f(x, y) = 2x + 3y + 200.$$

ANSWER: **minimum** value = _____

maximum value = _____