MATH 112 B, C
Exam II - Version 1
February 27, 2003

Name _____

Student ID #_____

Section _____

1	15	
2	19	
3	16	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no 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. (15 points) (NOTE: Although each of the following is a question about line-fitting, the questions are independent. Each part refers to a *different* set of data.)

   (a) For a set of data, the mean squared error for the line $y = mx + b$ is given by a function $E(b, m)$, where

   $$\frac{\partial E}{\partial b} = 2b + 3m - 4.4 \quad \text{and} \quad \frac{\partial E}{\partial m} = 5m + 3b - 3.6.$$

   Find the line that minimizes the mean squared error.

   ANSWER: _____

   (b) For a different set of data, the mean squared error for the line $y = mx + b$ is given by the function

   $$E(b, m) = b^2 + 11.5m^2 + 6bm - 9b - 23m + 23.$$

   Neither of the following is the best fitting line, but one fits better than the other. Which one is the better fit? (Finding the best fitting line will not help you answer this question.)

   i. $y = -x + 7$
   ii. $y = -0.75x + 6.75$

   ANSWER: (circle your choice) i ii

   (c) Compute $\sum \frac{s_i}{t_i}$ for the following set of data.

s_i	t_i
18	4
24	3
30	5

   ANSWER: $\sum \frac{s_i}{t_i} =$_____

2. (19 points) Let $f(s,t) = \frac{1}{24}s^3t^3 - s^2t^2 + \frac{15}{16}s^4t + \frac{14}{s}$.

(a) Compute $\frac{\partial f}{\partial s}$. You do not need to simplify.

ANSWER: $\frac{\partial f}{\partial s} =$_____

(b) If s is held constant at $s = 2$, then f becomes a function of a single variable. This new function is

$$g(t) = f(2,t) = \frac{1}{3}t^3 - 4t^2 + 15t + 7.$$

Find all values of t at which $g(t)$ has horizontal tangents.

ANSWER: $t =$_____

(c) What is the largest value of $g(t)$ on the interval from $t = 0$ to $t = 10$?

ANSWER: _____

(d) Let $S(t)$ be the slope of the diagonal line to the point $(t, g(t))$. Then $S(t) = \frac{g(t)}{t}$. Write out formulas for $S(t)$ and $S'(t)$.

ANSWER: $S(t) =$_____

$S'(t) =$_____

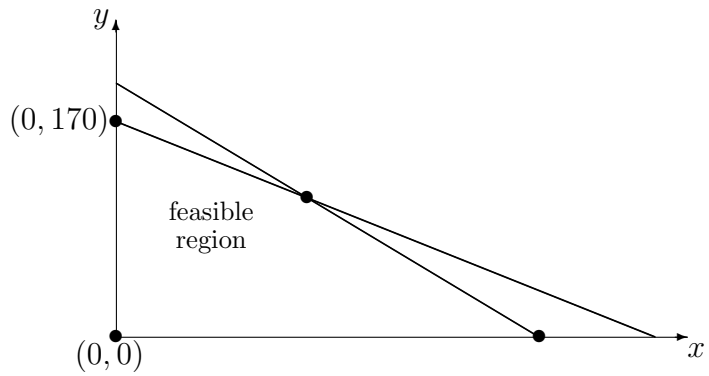
3. (16 points) Oscar MacBee sells boxes of toys and balloons for children's parties. The Standard Box contains 20 tiny toys and 15 balloons. The DeLuxe Box contains 50 tiny toys and 25 balloons. Oscar has just done a complete check of his inventory and has found that he has 8500 tiny toys and 5000 balloons. Let x be the number of Standard Boxes Oscar sells and y be the number of DeLuxe Boxes Oscar sells.

   (a) Let $t(x, y)$ be the number of tiny toys Oscar needs in order to sell x Standard Boxes and y DeLuxe Boxes. Let $b(x, y)$ be the number of balloons Oscar needs in order to sell x Standard Boxes and y DeLuxe Boxes. Give the formulas for $t(x, y)$ and $b(x, y)$.

   ANSWER: $t(x, y) =$_____

   $b(x, y) =$_____

   (b) The following is the graph of the feasible region. Two of the vertices are given. Give the coordinates of the remaining vertices of the feasible region.



   (c) Suppose Oscar makes \$12.50 profit on each Standard Box and \$16.50 profit on each DeLuxe Box. What is Oscar's maximum possible profit?

   ANSWER: \$_____

   (d) Suppose instead that Oscar makes \$15 profit on each Standard Box and \$27 profit on each DeLuxe Box. How many of each box should Oscar sell in order to maximize profit? (You must show work or explain your answer to receive credit.)

   ANSWER: Standard: _____ Deluxe: _____