MA 162 **Russell Brown**
Exam 2 **12 March, 1993**

Answer all of the following questions. Use the backs of the question papers for scratch paper. Additional sheets are available if necessary. No books or notes may be used. When answering these questions, please be sure to 1) check answers when possible, 2) clearly indicate your answer and the reasoning used to arrive at that answer **(unsupported answers will receive NO credit)**, and 3) label all variables and equations.

Question	Score	Total
1		20
2		20
3		20
4		20
5		20
Total		100

Name ____

Section ______________________

1. A company manufactures textbooks using labor, coverboard and paper. The MA109 text requires 0.4 hours of labor, 1.5 square feet of coverboard and 150 sheets of paper. The MA123 text requires 0.5 hours of labor, 2 square feet of coverboard and 125 sheets of paper. The MA162 text requires 0.6 hours of labor, 2.2 square feet of coverboard and 200 sheets of paper. The company receives a profit of \$5.00 on a MA109 book, \$4.50 on a MA123 book and \$6.75 on a MA162 book. The company has available a total of 800 hours of labor, 1500 square feet of coverboard, and 200,000 sheets of paper.

   Write down a linear program whose solution gives the number of each text they should produce to maximize their profit. Be sure to define each variable and label the constraints. Do not solve the linear program.

2. Consider the linear program

$$\begin{array}{ll} \min\ 2x + y & \\ \text{subject to} & x + y \geq 5 \\ & x + 2y \geq 6 \\ & x \geq 0, \quad y \geq 0. \end{array}$$

a) Graph the feasible set and find the coordinates of each corner point.

b) Find the solution of the above linear program.

c) What will the solution be if the objective function is $x + 3y$?

d) What will the solution be if the objective function is $-x$?

3. Consider the tableau

Row	P	x	y	s_1	s_2	RHS
1	1	-2	-1	0	0	0
2	0	1	2	1	0	6
3	0	2	1	0	1	6

a) List the basic and nonbasic variables.

b) What are the values of the decision variables when $s_1 = 2$ and $s_2 = 4$. Is this point feasible? Why or why not?

c) Circle the pivot element in the above tableau and carry out exactly one pivot.

d) For the tableau you found in part c), give the value of the objective function and the augmented coordinates of the associated corner point.

e) Is the tableau found in part c) optimal? Why or why not?

4. Solve the following linear program by the simplex method.

$$\begin{array}{ll} \max\ x + 2y & \\ \text{subject to} & x + y \leq 6 \\ & 2x + y \leq 10 \\ & x \geq 0, \quad y \geq 0. \end{array}$$

5. A company produces chairs, desks and tables. The primary resources they use are wood, assembly labor and finishing labor. The Lindo printout on the following page gives a linear program which maximizes their profit subject to constraints on labor and wood. In the printout the variables C, T and D stand for the number of chairs, tables and desks produced. Use this printout to answer the following questions.

a) How many tables, desks and chairs should they produce? What will be the resulting profit?

b) Suppose that they can hire additional labor. Should they put these workers in the assembly shop or the finishing shop? Why?

c) Suppose a shipment of 100 board feet of lumber is lost. What will be the effect on their profit?

d) Suppose that the profit on chairs decreases to \$10. What will be their new total profit?

e) Suppose that the profit on chairs remains at \$18 and the profit on tables increases to \$35. What will their new profit be?