

TEST TWO, MA 114, DR. JING'S SECTION  
OCTOBER 4, 2005.

**Print Your Name:**

**Row:**

**Seat number:**

*Please turn in the current page and work sheets and place them on the pile marked with your row number.*

**PLEASE SHOW YOUR WORK FOR PARTIAL CREDITS.**

1. (40 pts) In the following we consider the optimal problem: Maximize the function  $P = 3x + 2y$  subject to the following constraints

$$\begin{aligned} -x + y &\leq 2 \\ x + y &\leq 6 \\ y - x &\geq -2 \\ x \geq 0, y &\geq 0 \end{aligned}$$

- (a) Set up the initial simplex tableau.  
(b) What is the first pivot element?  
(c) Complete the pivoting and find  $x$  and  $y$  such that  $P$  is maximum.  
(d) Write down all basic solutions associated with each simplex tableau that you work out in Part (c).

2. (30 pts) The following simplex tableau represents some optimal problem.

$$A = \begin{pmatrix} 0 & 0 & 1 & -1 & 2 & 0 & 10 \\ 1 & 0 & 0 & -3 & 1 & 0 & 6 \\ 0 & 1 & 0 & 2 & -1 & 0 & 4 \\ 0 & 0 & 0 & 6 & -1 & 1 & -36 \end{pmatrix}$$

- (a) How many constraints are there in this problem?  
(b) Find the basic solution for this simplex tableau. Explain why it is not a final optimal solution.  
(c) Use the pivot procedure to find the final optimal simplex tableau.  
(d) State the optimal problem and give its answer.

3. (30pts) (a) State the dual problem for the linear programming problem: Maximize  $P = 12x + 18y + 6z$  subject to

$$\begin{aligned} 2x + y &\leq 4 \\ x + 2y + z &\leq 5 \\ x \geq 0, y \geq 0, z &\geq 0 \end{aligned}$$

- (b) What are the initial tableaux for both the primal and dual problems.  
(c) Suppose the following is the final simplex tableau for the primal problem. Find the answers for both the primal and dual optimal problems.

$$\begin{pmatrix} 1 & 0 & -1/3 & 2/3 & -1/3 & 0 & 1 \\ 0 & 1 & 2/3 & -1/3 & 2/3 & 0 & 2 \\ 0 & 0 & 2 & 2 & 8 & 1 & 48 \end{pmatrix}$$