Math 201 Practice Test 3, Fall 2010

Section ______ Name___________________

No calculators are allowed on this exam. Total time: 1 hour. Total points: 100

For all problems, show appropriate work to receive credits.

1. Draw the solution region (feasible region), then determine whether the region is bounded or unbounded or empty. Calculate the coordinates of all corner points if there is any.

   \[ 2x + 3y \geq 12 \]
   \[ -x + 3y \geq 3 \]
   \[ 0 \leq y \leq 3 \]

   \[ 4x + 3y \leq 48 \]
   \[ 2x + y \geq 24 \]
   \[ y \geq 0 \]
2. Maximize and minimize \( P = 7x + 2y \) subject to
\[
3x + y \leq 50 \\
5x + y \leq 70 \\
2x + y \leq 80 \\
x, y \geq 0
\]

a. Find the feasible region;

b. Find the coordinates of all corner points;

c. Find the maximum and minimum value if there is any; indicate the coordinates of the points where the maximum or minimum occurs.
3. Maximize and minimize $C = 2x + 2y$ subject to

\[\begin{align*}
3x + 2y &\geq 160 \\
x + 2y &\geq 80 \\
5x + 2y &\geq 200 \\
x, y &\geq 0
\end{align*}\]

a. Find the feasible region;

b. Find the coordinates of all corner points;

c. Find the maximum and minimum value if there is any; indicate the coordinates of the points where the maximum or minimum occurs.
4. Given the linear programming problem:

\[
\begin{align*}
2x_1 + x_2 &\leq 8 \\
\text{Maximize } P &= 6x_1 + 2x_2 \text{ subject to } x_1 + 2x_2 \leq 10 \text{ using Simplex Method.} \\
x_1, x_2 &\geq 0
\end{align*}
\]
5. (manufacturing) A company manufactures outdoor furniture consisting of regular chairs, rocking chairs, and chaise lounges. Each piece of furniture passes through three different production departments: fabrication, assembly and finishing. Each regular chair takes 1 hour to fabricate, 2 hours to assemble, and 3 hours to finish. Each rocking chair takes 2 hours to fabricate, 2 hours to assemble, and 3 hours to finish. Each chaise lounge takes 3 hours to fabricate, 4 hours to assemble, and 2 hours to finish. There are 2,500 labor-hours available in the fabrication department, 3,000 in the assembly department, and 3,500 in the finishing department. The company makes a profit $17 on each regular chair, $24 on each rocking chair, and $31 on each chaise lounge. How many chairs of each type should the company produce in order to maximize profit? What is the maximum profit?

a. Assign variables to unknowns and write the objective function;

b. Set up the constraints;

6. How many cards in a standard deck of 52 (13 hearts, 13 diamonds, 13 clubs, 13 spades) are red cards or aces?
7. How many unique 3 course meals are possible at Fred’s Fast Food Emporium if the menu contains 3 Sandwiches, 3 vegetable offerings (French Fries, tater tots and curly fries) and two drinks (milk and root beer)?

8. Solve the following using \( nP_r \) or \( nC_r \).

(a.) How many 3-digit opening combinations are possible on a combination lock with 6 digits if the digits cannot be repeated?

(b.) Five tennis players have made the finals. If each of the 5 players is to play every other player exactly once, how many games must be scheduled?
9. A software development department consists of 6 women and 4 men.

(a.) How many ways can the department select a chief programmer, a backup programmer, and a programming librarian?

(b.) How many of the selections in (a.) consist entirely of women?

(c.) How many ways can the department select a team of 3 programmers to work on a particular project?