Math 141 Week-in-Review 4 Problem Set

1. Graph the following system of inequalities and find all corner points. Is the feasible region bounded or unbounded?

   (a) $2x - y \leq 4$
   $2x + 3y \leq 12$
   $x \geq 0$
   $y \geq 1$

   (b) $-x + 3y \geq 1$
   $5x - y \geq 9$
   $x + y \leq 9$
   $x \leq 5$

2. Minimize $C = 5x + 3y$
   Subject to:
   $x + y \geq 6$
   $6x + y \geq 16$
   $x + 6y \geq 16$
   $x \geq 0$
   $y \geq 0$

   Follow up question: Is there a maximum for C subject to these constraints?

3. Maximize $P = 20x + 10y$
   Subject to:
   $2x + 3y \geq 30$
   $2x + y \leq 26$
   $-2x + 5y \leq 34$
   $x \geq 0$
   $y \geq 0$

4. (Modified from *Finite Mathematics* by Barnett, Ziegler, & Byleen) An investor has no more than \$60,000 available to invest in a bond and a savings account. The bond yields 5% interest per year and the savings account yields 9% interest per year. However, the investor wants no less than \$10,000 in the savings account and requires that at least twice as much money should be invested in bonds as the savings account. How much money should be invested in the two accounts in order to maximize the interest? Set up the linear programming problem. Do not solve.

5. (Taken from *Finite Mathematics: An Applied Approach* by Long & Graening) A dietitian is to prepare two foods in order to meet certain requirements. Each pound of food I contains 100 units of vitamin C, 40 units of vitamin D and 10 units of vitamin E and costs 20 cents. Each pound of food II contains 10 units of vitamin C, 80 units of vitamin D and 5 units of vitamin E and costs 15 cents. The mixture of the two foods is to contain at least 260 units of vitamin C, at least 320 units of vitamin D and at least 50 units of vitamin E. How many pounds of each type of food should be used in order to minimize the cost? Set up the linear programming problem. Do not solve.

6. (Taken from *Finite Mathematics: An Applied Approach* by Long & Graening) A certain radio station finds that program A, with 20 minutes of music and one minute of advertising, has 100,000 listeners while program B, with 10 minutes of music and 1 minute of advertising, has 30,000 listeners. During a given week, the advertiser wants at least 6 minutes devoted to advertising and the radio station wants no more than 80 minutes of music from these two programs. How many times should each of these programs be aired each week in order to attract the maximum number of listeners?

7. (a) (Modified from *Mathematics: A Practical Odyssey* by Johnson & Mowry) A coffee shop sells two blends of coffee: Morning Blend and South American Blend. Each bag of Morning Blend coffee uses 2 pounds of Mexican beans and 1 pound of Colombian beans. Each bag of South American Blend uses 1 pound of Mexican beans and 2 pounds of Colombian beans. It costs the shop $4 to make each bag of Morning Blend and $2 to make each bag of South American Blend. Each day, they have at most 300 pounds of Mexican beans and 240 pounds of Colombian beans available to make coffee. How many bags should the shop make each day in order to minimize cost?

   (b) Are there any leftover resources?