

Math 141 Week in Review
Week 4 Problem Set

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

$$2x - y \leq 4$$

$$2x + 3y \leq 12$$

A. $x \geq 0$

$$y \geq 1$$

$$-x + 3y \geq 1$$

$$5x - y \geq 9$$

B. $x + y \leq 9$

$$x \leq 5$$

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:
 $2x + 3y \geq 30$
 $2x + y \leq 26$
 $-2x + 5y \leq 34$

4. An investor has no more than \$60,000 available to invest in bonds and a savings account. The bonds yield 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 is invested in bonds as the savings account. How much money should be invested in the two accounts to maximize the interest? Set up the linear programming problem. Do not solve.
(Modified from Finite Mathematics by Barnett, Ziegler, & Byleen)

5. A polar expedition is at least 240 miles away from base camp and a snowstorm is predicted to reach the area in 48 hours. The expedition will travel part of the distance by boat and then walk the remaining distance to camp before the storm hits. The explorers can navigate the boat through the ice at a rate of 12 miles per hour or walk with the equipment at a rate of 3 miles per hour. In no more than 18 hours, the ice will be too thick for the boat to manage. The explorers must expend 300 calories per hour walking and 230 calories per hour navigating the boat. What amount of time should the explorers spend walking and on the boat to minimize the amount of energy they must expend to reach base camp? (Hint: Distance equals rate times time, i.e., $d = r \cdot t$) Set up the linear programming problem. Do not solve.

6. 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? (From Finite Mathematics: An Applied Approach by Long & Graening)

7. A coffee shop sells two blends of coffee: Morning Blend and Wired Blend. Each bag of Morning Blend coffee uses 1 pound of Sumatran beans and 2 pounds of Colombian beans. Each bag of Wired Blend uses 2 pounds of Sumatran beans and 1 pound of Colombian beans. It costs the shop \$4 to make each bag of Morning Blend and \$6 to make each bag of Wired Blend. Each day, they have at most 120 pounds of Sumatran beans and 150 pounds of Colombian beans available to make coffee and expect to sell at least 24 bags of coffee.
- A.** How many bags should the shop make each day in order to minimize cost?
- B.** Are there any leftover resources?