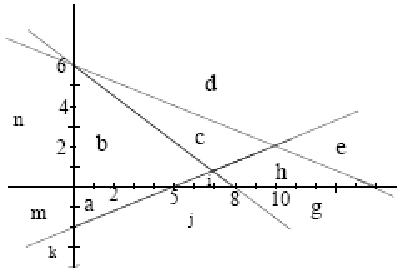
Week in Review # 5

MATH 141 Drost-Spring 2010

3.1, 3.2, 3.3

1. Write a system of inequalities which represents region c in the graph below.



Bounded Regions:

A region is **bounded** if you can draw a circle around it.
A region is **unbounded** if you cannot draw a circle around it.

2. Using the graph above,
   a. name four bounded regions.
   b. name four unbounded regions.

To GRAPH a system of linear inequalities:

Solve all inequalities for y.
Graph the inequalities.
Use dotted lines for <, or >.
Use solid lines for $\leq$ or $\geq$.
Determine which half-plane satisfies the inequality.
REVERSE SHADING: shade the side which does NOT satisfy the inequalify.
SOLUTION SET: all points left unshaded.

3. Graph the feasible set using reverse shading:

$$\begin{cases} x + y & \geq & 4 \\ x - 3y & \geq & -6 \\ x - y & \geq & -6 \\ x \geq 0 & & y \geq 0 \end{cases}$$

4. Graph the feasible set using reverse shading:

$$\begin{cases} x + y & \geq & 2 \\ 9x + 5y & \leq & 90 \\ 3x + 5y & \leq & 60 \\ x \geq 0 & & y \geq 0 \end{cases}$$

5. Set-up but do not solve the following Linear Programming Problem.

   A group of Aggies decide to ship boxes of Christmas gifts to servicemen and women overseas during the holidays.

   Each large box weighs 15 lbs, costs \$5 to fill and has one phone-home-free card.

   Each small box weighs 2 lbs, costs \$4 to fill and has two phone-home-free cards.

   The students found a faculty sponsor willing to pay costs up to \$100 if the weight of the boxes was no more than 150 pounds, and if they sent at least ten phone-home-free cards.

   How many boxes of each size should they send to maximize Christmas wishes, if twelve cards are tucked in each large box, and eight cards are tucked in each small box?

6. Formulate but do not solve:

   Product X has 125 calories, 4 grams of fat, 12 grams of protein, and costs \$4.

   Product Y has 180 calories, 2 grams of fat, 20 grams of protein, and costs \$5.

   Product Z has 225 calories, 6 grams of fat, 24 grams of protein, and costs \$8.

   If your daily calorie intake must be less than or equal to 1000 calories, your total fat intake each day should be no more than 25 grams of fat, and your doctor has recommended at least 90 grams of protein, AND your budget is restricted to \$30 per day, find the feasible set which meets all these constraints.

7. Set-up but do not solve the following Linear Programming Problem.

   A small clothing operation manufactures two products, A and B. The company is limited to 36 hours of labor, 12 yards of cloth, and 20 hours on the sewing machine.

   Each product A requires 4 hrs of labor, 3 yds of cloth, and 1 hr on the sewing machine.

   Each product B requires 5 hrs of labor, 6 yds of cloth, and 3 hrs on the sewing machine.

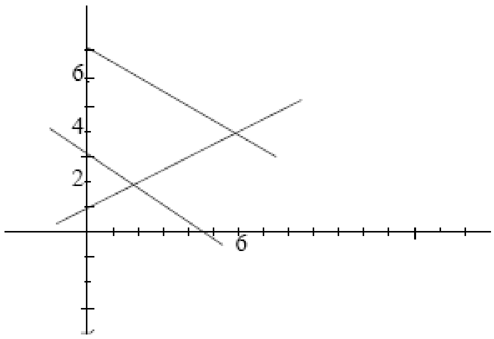
   If the profit on each product A is \$10, and the profit on each product B is \$5, find the number of each product that should be produced to maximize the profit.

METHOD of Corners for Bounded Solution Set

Graph the feasible region.
Find the coordinates of all corner points.
Make a table and evaluate the objective function at each corner point.

Note: If the function is optimized at two corner points, then the objective function is optimized at every point along the line segment connecting these two points as well. Infinitely many solutions.
If the region is unbounded, a maximum or minimum value may not be possible..

8. In the figure below, the region bounded by the points $(2, 2)$, $(6, 4)$, $(0, 7)$ and $(0, 3)$ represents the feasible set. Maximize $P = 5x - 3y$ over the feasible region using the method of corners.



9. Maximize the feasible region from problem #3, for $P = x + 0.5y$.

10. Maximize the feasible region from problem #4, for $P = 2x + 1.5y$.