Week in Review #3

Section 3.2: Linear Programming Problems.

- Components of a linear programming problem.
    - The **objective function** is what will be maximized or minimized in the problem.
    - The **constraints** is the system of inequalities for the problem.
    - The non-negativity constraints are the $x \geq 0$, $y \geq 0$, ...

1. Set up the following linear programming problem.

   A housing contractor wants to develop a 41 acre tract of land. He has three types of houses: a small 3 bedroom, a large 3 bedroom and a 4 bedroom house. The small three bedroom house requires $60,000 of capital for a profit of $20,000, the large three bedroom house requires $64,000 of capital for a profit of $25,000, and the four bedroom house requires $80,000 of capital for a profit of $24,000. The small three bedroom needs 4000 labor hours, the large three bedroom needs 3000 labor hours, and the 4 bedroom house needs 3900 labor hours. There are currently 250000 labor hours available. If the small three bedroom house is on half an acre, the large 3 bedroom house is on 0.75 acres, the four bedroom house is on 1.5 acres and the contractor has 4.5 million in capital, how many of each type should be built to maximize the profit?

2. Set up the following linear programming problem.

   Your umbrella company makes three models: the Sprinkle, the Storm, and the Hurricane. The amounts of cloth (square yards), metal(pounds), and wood(pounds) used in making each model are given in the table.

	Cloth	Metal	Wood
Sprinkle	1	2	1
Storm	2	1	3
Hurricane	2	3	6

   The profit for the Sprinkle is $1, for the Storm is $1 and for the Hurricane is $2. Due to certain agreements, the company can make at most 170 Sprinkle umbrellas. If the company has 300 square yards of cloth, 800 pounds of metal, 600 pounds of wood, how many of each type of umbrella should be produced in order to maximize the profit?

3. Set up the following linear programming problem.

   Dave operates a book publishing company that prints its books in two different cities. Due to the cost of printing and storing the books, City A can only print up to 15,000 books per month and City B can only print up to 8,000 books per month. These books are shipped to three colleges; C, D and E, located across the country. The minimum requirement of the colleges as well as the shipping cost per book to the colleges can be found in the table.

College	books needed	shipping from city A	shipping from city B
C	4000	$1.15 per book	$1.00 per book
D	10000	$1.75 per book	$1.35 per book
E	8000	$1.35 per book	$1.28 per book

   What shipping schedule should the company use so that the shipping cost are kept to a minimum?

Section 3.1: Graphing Systems of Linear Inequalities in Two Variables.

- dashed line for $<$ or $>$
- solid line for $\leq$ or $\geq$
- shading the feasible region(true side) or the unfeasible region(false side)
- bounded region (can be enclosed in a circle)
- unbounded region (can not be enclosed in a circle)

4. Graph the feasible region of $6x - 7y > 42$

5. Graph the feasible region of $-x + 5y \geq 0$

6. Graph the feasible region for this system of linear inequalities.

   $2x - y < 3$
   $x + y \geq 6$
   $x < 4$

7. Graph the feasible region for this system of linear inequalities.

   $8x + 5y \leq 40$
   $3x + 5y \geq 30$
   $x - 4y \geq 0$

8. Graph the feasible region for this system of linear inequalities.

   $3x + y \geq 12$
   $6x + 5y \geq 30$
   $x + 2y \geq 14$
   $x, y \geq 0$