Math 141 - Week in Review #4

1. Graph the solution set for the given system of linear inequalities: $\begin{array}{c} x+y \leq 36 \\ 10 \leq x \leq 30 \\ 6 \leq y \leq 20 \end{array}$

2. Find the maximum and minimum values (and their locations) for the function $G = 3x+5y$ subject to the constraints given in #1.

   For the next 3 exercises, first solve by the Method of Corners, and then solve by the Simplex Method (from Section 4.1) if possible.

3. A bicycle manufacturer makes a 3-speed and a 10-speed model with two operations: assembly and painting. Each 3-speed bike requires 1 hour to assemble and 2 hours to paint. Each 10-speed bike takes 1 hour to assemble and 1 hour to paint. The assembly operation has 80 hours per week available, and the painting operation has 100 work hours available each week. If the company makes $80 on each 3-speed bike and $60 on each 10-speed bike, how many bicycles of each type should be made and sold each week to maximize profits? (#39, pg. 226 of *Finite Mathematics: An Applied Approach* by Young, et. al.)

4. A company makes two calculators: a business model and a scientific model. The business model contains 10 microcircuits and requires 20 minutes to program, while the scientific model contains 20 microcircuits and requires 30 minutes to program. The company has a contract that requires it to use at least 320 microcircuits each day, and the company has 14 hours of programming time available each day. The company also wants to make at least twice as many business calculators as scientific calculators. If each business calculator requires 10 production steps and each scientific calculator reqires 12 production steps, how many calculators of each type should be made each day to minimize the number of production steps? (adapted from #24, pg. 192 of *Finite Mathematics: An Applied Approach* by Young, et. al.)

5. The directors of a state fair want to bring in entertainers to bolster attendance at the fair. They find that a top star demands $10,000, a faded star $6,000, and high-quality local talent $3,000 for each performance. The directors estimate that 8,000 people will attend a top-star performance, 3,000 will attend a faded-star performance, and 1,200 will attend a high-quality local talent performance. The total amount to be spent for such entertainers is not to exceed $50,000, and the directors decide to contract for no more than six performers in total. The amount spent on advertising is not to exceed $4,000, and the directors estimate that the advertising costs for each type of entertainer will be $500, $400, and $250, respectively. Assuming one performance for each entertainer, how many of each type should be contracted to maximize attendance? Will there be any surplus contracting or advertising funds left over? If so, how much? (#49, pg. 227 of *Finite Mathematics: An Applied Approach* by Young, et. al.)

   For the next two exercises, first solve using the Method of Corners, and then solve using the Simplex Method.

6. Maximize $P = 2x+5y$
   subject to
   $$\begin{array}{c} -3x+y \leq 6 \\ x-y \leq 7 \\ x \geq 0 \\ y \geq 0 \end{array}$$

7. Maximize $P = 2x+y$
   subject to
   $$\begin{array}{c} x+y \leq 4 \\ 2x+y \leq 5 \\ 5x+y \leq 10 \\ x \geq 0 \\ y \geq 0 \end{array}$$