MATH 326: Homework 2 SPRING 2013

- 1. A small organic farmer is going to plant soy beans and broccoli. Assume that each acre of soybeans earns \$100 and each acre of broccoli earns \$175. Each acre of soy beans requires 2 workers while each acre of broccoli requires 3 workers. Each acre of soybeans requires 2 tons of (organic) compost fertilizer while each acre of broccoli requires 4 tons of (organic) compost fertilizer. Assuming that no more than 25 acres of land can be used to farm broccoli, due constraints on soil conditions, and that up to 120 tons of fertilizer are available and the farm can use up to 100 workers, state the linear programming problem that will allow the farm to maximize its profits. [*Hint*: Let x_1 be the number of acres used for soybeans and x_2 be the number of acres used for broccoli.]
- 2. Use the graphical method for solving linear programming problems to solve the linear programming problem you defined in Problem 1. [Follow the recipe from class notes.]
- 3. Modify the linear programming problem from Problem 1 to obtain a linear programming problem with an infinite number of alternative optimal solutions. Solve the new problem and obtain a description for the set of alternative optimal solutions. [*Hint*: Just as in the example from class, x_1 will be bound between two value corresponding to a side of a polygon. Find those values and the constraint that is binding. This will provide you with a description of the form for any $x_1^* \in [a, b]$ and x_2^* so that $cx_1^* + dx_2^* = v$, the point (x_1^*, x_2^*) is an alternative optimal solution to the problem. Now you fill in values for a, b, c, d and v.]