## Linear Optimization Homework # 3 DUE ON 3/27/2013 IN CLASS

## March 17, 2013

(1) Solve the following problem exactly like we did in class (notice that this is the same problem) with your initial basis  $B = I_2$  (the columns corresponding to slack variables),

- 1. Show the extreme point associated with the current BFS on graph,
- 2. Calculate reduced costs to find entering variable,
- 3. Apply **min-ratio test** to find leaving variable (we will learn it this week),
- 4. Modify basis, repeat.

(2) In class we proved the following key results,

- W.l.o.g. we can assume rank(A) = m, where  $A : m \times n$  real matrix.
- Let  $\bar{x}$  be an extreme point of  $\{x \in \mathbb{R}^n : Ax = b, x \ge 0\}$ , then the columns of A corresponding to the non-zero components of  $\bar{x}$  forms a linearly independent set.

Let  $\overline{B}$  be the submatrix of A corresponding to the non-zero components of  $\overline{x}$ . Show that we can complete  $\overline{B}$  to a basis of  $\mathbb{R}^m$  using a suitable subset of other columns of A.

(3) Solve the following problem using the geometric solution method.

(4) Solve problem (3) using the simplex method given in problem (1).

(5) Solve the following problem with the simplex method in table form (watch out for the initial form!),

(6) Solve the following problem with the 2-phase simplex method in table form.