

Please write each solution to a separate (new) page.

1. During pivoting in simplex, why is the following true: If in one of the profitable columns of the matrix every number is negative then the set of solutions is unbounded? What if only every is non-positive (i.e., 0 is allowed)?
2. Can a pivot of the simplex algorithm move the feasible point a positive distance while leaving the cost unchanged? (if yes, provide example)
3. Can a vector which just left the basis in the simplex algorithm reenter on the next pivot? (if yes, provide an example)
4. Show an example: In the pivot in **each** of the possible columns (not only profitable)  $\Theta = 0$ , but it is not an optimal solution.
5. Show that an LP cannot cycle unless we have a basic feasible solution with at least two basic variables that are 0. (i.e., having at most  $m - 2$  non-zero coordinates.
6. Check that Farkas' Lemma holds when the set  $\{a_i\}$  is empty.