IE 601, Optimization Techniques
Assignment 03, September 05, 2019
Due Wednesday, September 11, 2019 in class

Note: There are 5 questions on 1 page(s). Submit a report written in your own words. Write your name and roll number clearly on the report.

1. For each of the following two systems, write the corresponding version of Farkas Lemma. Show that your version is correct by transforming your problem in to one of the versions proved in the book.

   (a) $Ax \leq b$

   (b) $Ax = b, Gx \geq d, Hx \leq p$

2. Exercise 5.40 [BJS, 2nd Ed.]

3. Exercise 5.51 [BJS, 2nd Ed.]

4. Exercise 5.55 [BJS, 2nd Ed.]

5. Suppose we have an LP in standard form but with general bounds on variables:

$$\min c^\mathsf{T} x$$
$$\text{subject to } Ax = b, \qquad\qquad\qquad\qquad\text{(P)}$$
$$u \geq x \geq l.$$

   Suppose a variable, say x_1 has $l_1 = u_1$, which means the variable is fixed. Suppose we do not remove this variable from the problem, and try to solve using the simplex method. Can x_1 enter the basis? Explain. If x_1 is not in the optimal basis, will its reduced cost in the optimal basis be zero, positive or negative?