Homework 4

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October 6, 2016

1: Consider the linear program (LP) min $c^T x$ such that $Ax = b, x \geq 0$ where

$$A = \begin{bmatrix} -6 & -5 & 25 & 3 & -85 & 4 & 30 \\ 24 & -2 & 28 & 6 & -55 & 1 & -9 \\ 9 & -5 & 11 & 2 & -55 & -1 & 19 \end{bmatrix}, \quad b = \begin{bmatrix} 62 \\ 62 \\ 3 \end{bmatrix}, \quad c = \begin{bmatrix} 23 & 1 & -16 & -1 & 52 & -6 & -12 \end{bmatrix}^T$$

Solve this problem using the Simplex Method, starting from the basis consisting of A's columns 1, 3, 6.

2: Consider the linear program (LP) min $c^T x$ such that $Ax = b, x \geq 0$ where

$$A = \begin{bmatrix} 8 & -226 & -33 & 10 & 9 & 49 & -1 \\ 9 & -199 & -51 & 10 & 3 & 25 & -25 \\ 2 & 24 & 45 & -6 & 3 & -45 & -15 \end{bmatrix}, \quad b = \begin{bmatrix} 107 \\ 55 \\ 25 \end{bmatrix}, \quad c = \begin{bmatrix} -4 & 63 & 7 & -2 & -2 & 0 & 21 \end{bmatrix}^T$$

Solve this problem using the Simplex Method, starting from the basis consisting of A's columns 1, 3, 4.

3: Consider the linear program (LP) min $c^T x$ such that $Ax = b, x \geq 0$ where

$$A = \begin{bmatrix} 7 & 7 & 45 & -1 & 3 & -53 & -68 \\ 9 & -5 & 27 & -115 & 7 & -129 & 42 \\ 5 & -3 & 63 & -96 & 10 & -109 & 86 \end{bmatrix}, \quad b = \begin{bmatrix} 26 \\ 18 \\ 34 \end{bmatrix}, \quad c = \begin{bmatrix} 1 & 7 & -37 & 94 & -9 & 76 & -146 \end{bmatrix}^T$$

a) Solve this problem using the Simplex Method, starting from the basis consisting of A's columns 1, 2, 5.

b) Solve this problem using the Simplex Method, starting from the basis consisting of A's columns 1, 2, 7. Comment on the difference in outcome between this part b and the previous part a.

c) Solve this problem using the Simplex Method, starting from the basis consisting of A's columns 1, 3, 6. Observe how the objective function changes through this particular Simplex Method implementation, and comment on an anomaly.