

# Discrete Optimization: Homework #6, Ex. #5

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We must solve the following Linear Program with the Simplex Algorithm:

$$c = \begin{pmatrix} 6 \\ 9 \\ 2 \end{pmatrix} \quad A = \begin{pmatrix} 1 & 3 & 1 \\ 0 & 1 & 1 \\ 3 & 3 & -1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad b = \begin{pmatrix} -4 \\ -1 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad x_0^* = \begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}$$

## 1 Step 1

$$B_0 = \{1, 2, 6\} \quad A_{B_0} = \begin{pmatrix} 1 & 3 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow \lambda_0 = \begin{pmatrix} 6 \\ -9 \\ 5 \end{pmatrix} \Rightarrow d_0 = \begin{pmatrix} 3 \\ -1 \\ 0 \end{pmatrix} \Rightarrow K = \{3, 4\}$$

The min is attained in  $k=3$

## 2 Step 2

$$B_1 = \{1, 3, 6\} \quad A_{B_1} = \begin{pmatrix} 1 & 3 & 1 \\ 3 & 3 & -1 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow \lambda_1 = \begin{pmatrix} 1.5 \\ 1.5 \\ 2 \end{pmatrix} \Rightarrow B_1 \text{ is optimal}$$