1

(Reference: ???)

Consider the LP problem

$$\begin{array}{rl} \text{maximize} & c^T x \\ \text{subject to} & Ax = b \\ & x \geq 0, \end{array} \tag{1.1}$$

where $c, x \in \mathbb{R}^{\ltimes}$, $b \in \mathbb{R}^{>}$, and A is $m \times n$ matrix. The tableau with respect to the basis B and nonbasis N is:

$$\begin{array}{cccc} & x_B & +\bar{A}_N x_N & = & \bar{b} \\ z & & -\bar{c}_N x_N & = & \bar{v} \end{array} \tag{1.2}$$

Following is a description of criss-cross pivoting:

Algorithm 1.1

1. *Let r be the smallest index satisfying:*

   $$r \in B, \bar{b}_r < 0 \ \ \underline{or} \ \ r \in N, -\bar{c}_r < 0.$$

   If r does not exist, then **STOP**. *The tableau is* *<u>optimal</u>.*

2. *Let s be the smallest index satisfying:*

   $$r \in B, s \in N, \bar{a}_{rs} < 0 \ \ \underline{or} \ \ r \in N, s \in B, \bar{a}_{sr} > 0.$$

   If s does not exist, then **STOP**. *The tableau is <u>infeasible</u> if $r \in B$ and <u>dual-infeasible</u> if $r \in N$.*

3. *Where*

   $$(\bar{r}, \bar{s}) = \begin{cases} (r, s) & \text{if } r \in B \\ (s, r) & \text{if } s \in B \end{cases}$$

   "pivot" on $(\bar{r}, \bar{s})$, That is, change the basis B by:
   replacing r by s if $r \in B$
   <u>or</u> replace s by r if $r \in N$.