We choose $k = 2$ to be the new element that will be added to the basis. This is because $c_2 = 1 > 0$, and k is the smallest element that satisfies this constraint (Bland's rule)

$t = min\{array([2.]), array([5.])\} = [2.]$

$x_B = b - tA_k = \begin{bmatrix} 2 \\ 5 \end{bmatrix} - [2.] \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0. \\ 3. \end{bmatrix}$

This means that $r = 1$. This is the smallest 0-element index of the new x_B (by choosing this element, we are adhering to Bland's rule)

This means that our "better basis" is $B = \{13\}$.

The LP:
$\max \begin{bmatrix} 0 & 1 & 3 & 0 \end{bmatrix} x + 0$

s.t.
$\begin{bmatrix} 1 & 1 & 2 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix} x = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$
$x \geq \mathbb{O}$

Written in canonical form with the basis $B = \{13\}$ is:

$\max \begin{bmatrix} -1. & 0. & 1. & 0. \end{bmatrix} x + 2.0$

s.t.
$\begin{bmatrix} 1. & 1. & 2. & 0. \\ -1. & 0. & -1. & 1. \end{bmatrix} x = \begin{bmatrix} 2. \\ 3. \end{bmatrix}$
$x \geq \mathbb{O}$

We choose $k = 3$ to be the new element that will be added to the basis. This is because $c_3 = 1. > 0$, and k is the smallest element that satisfies this constraint (Bland's rule)

$t = min\{array([1.])\} = [1.]$

$x_B = b - tA_k = \begin{bmatrix} 2. \\ 3. \end{bmatrix} - [1.] \begin{bmatrix} 2. \\ -1. \end{bmatrix} = \begin{bmatrix} 0. \\ 4. \end{bmatrix}$

This means that $r = 2$. This is the smallest 0-element index of the new x_B (by choosing this element, we are adhering to Bland's rule)

This means that our "better basis" is $B = \{23\}$.

The LP:
$\max \begin{bmatrix} -1. & 0. & 1. & 0. \end{bmatrix} x + 2.0$

s.t.
$\begin{bmatrix} 1. & 1. & 2. & 0. \\ -1. & 0. & -1. & 1. \end{bmatrix} x = \begin{bmatrix} 2. \\ 3. \end{bmatrix}$
$x \geq \mathbb{O}$

Written in canonical form with the basis $B = \{23\}$ is:

$\max \begin{bmatrix} -1.5 & -0.5 & 0. & 0. \end{bmatrix} x + 3.0$

s.t.
$\begin{bmatrix} 0.5 & 0.5 & 1. & 0. \\ -0.5 & 0.5 & 0. & 1. \end{bmatrix} x = \begin{bmatrix} 1. \\ 4. \end{bmatrix}$
$x \geq \mathbb{O}$

STOP! $c_N = \begin{bmatrix} -1.5 \\ -0.5 \end{bmatrix} \leq 0$. The basic solution $\bar{x}$ is optimal