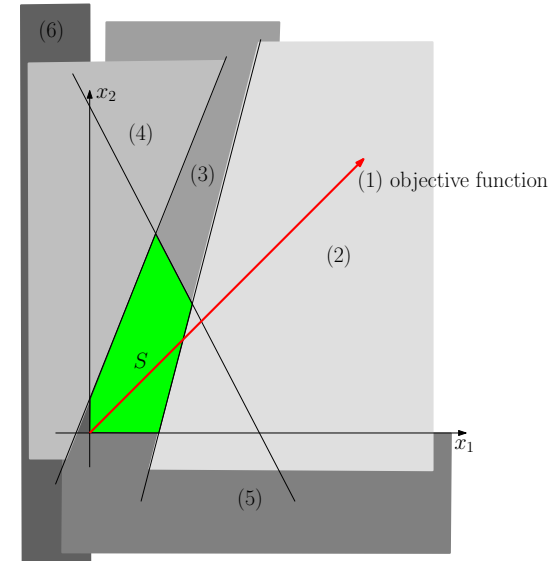


Example Execution

$$A = \begin{pmatrix} 4 & -1 \\ 2 & 2 \\ -5 & 2 \\ -1 & 0 \\ 0 & -1 \end{pmatrix}, \quad b = \begin{pmatrix} 8 \\ 10 \\ 2 \\ 0 \\ 0 \end{pmatrix}, \quad c = \begin{pmatrix} 1 \\ 1 \end{pmatrix},$$

$$x = \begin{pmatrix} 0 \\ 0 \end{pmatrix}.$$



Iteration 1

Step 1. $x = (0, 0)^\top$, $I = \{4, 5\}$

Step 2. $A_I = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$, $A_I^{-1} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$,

$$c^\top A_i^{-1} = (-1, -1)^\top,$$

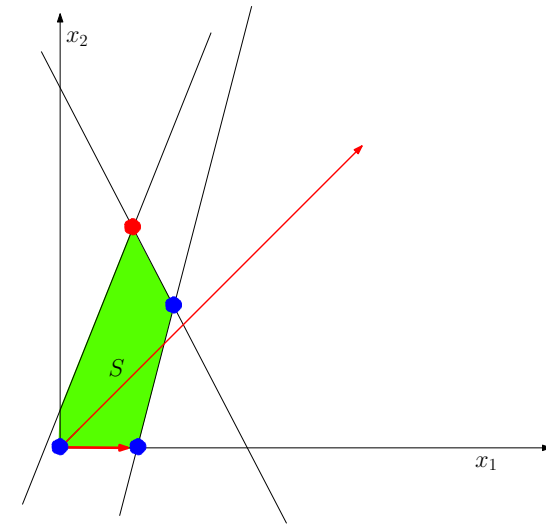
$$y = (0, 0, 0, -1, -1)^\top \quad y \not\leq 0$$

Step 3. $i = 4$, $w = (1, 0)^\top$,

$$Aw = (4, 2, -5, -1, 0)^\top \not\leq 0,$$

Step 4. $\lambda = \min \left\{ \frac{8 - 0}{4}, \frac{10 - 0}{2} \right\} = 2$, $j = 1$,

Step 5. $I = \{1, 5\}$, $x = (0, 0)^\top + 2(1, 0)^\top = (2, 0)^\top$.



Iteration 2

$$x = (2, 0)^\top, \quad I = \{1, 5\}$$

$$\text{Step 2. } A_I = \begin{pmatrix} 4 & -1 \\ 0 & -1 \end{pmatrix}, \quad A_I^{-1} = \frac{1}{4} \begin{pmatrix} 1 & -1 \\ 0 & -4 \end{pmatrix},$$

$$c^\top A_i^{-1} = (1/4, -5/4)^\top,$$

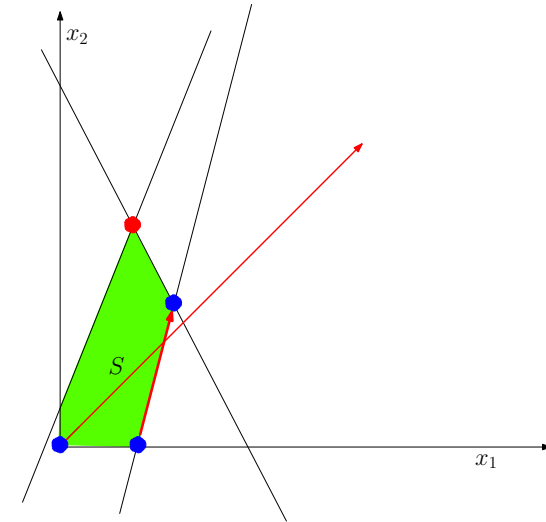
$$y = (1/4, 0, 0, 0, -5/4)^\top, \quad y \not\geq 0$$

$$\text{Step 3. } i = 5, \quad w = (1/4, 1)^\top,$$

$$Aw = (0, 3/2, -1/4, -1/4, -1)^\top \not\leq 0,$$

$$\text{Step 4. } \lambda = \min \left\{ \frac{10 - 4}{3/2} \right\} = 4, \quad j = 2,$$

$$\text{Step 5. } I = \{1, 2\}, \quad x = (2, 0)^\top + 4(1/4, 1)^\top = (3, 4)^\top.$$



Iteration 3

$$x = (3, 4)^\top, \quad I = \{1, 2\}$$

$$\text{Step 2. } A_I = \begin{pmatrix} 4 & -1 \\ 2 & 1 \end{pmatrix}, \quad A_I^{-1} = \frac{1}{6} \begin{pmatrix} 1 & 1 \\ -2 & -4 \end{pmatrix},$$

$$c^\top A_i^{-1} = (-1/6, 5/6)^\top,$$

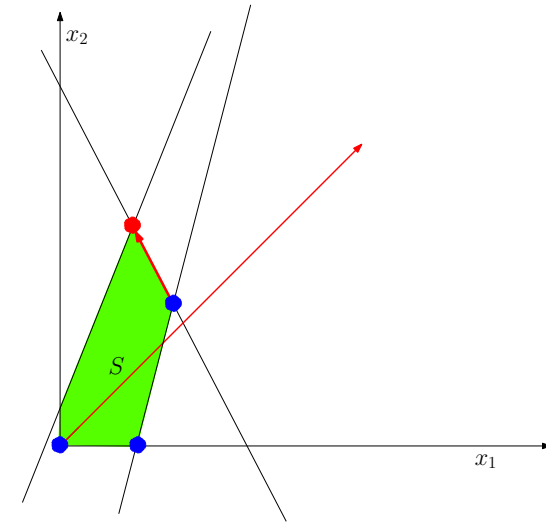
$$y = (-1/6, 5/6, 0, 0, 0)^\top, \quad y \not\geq 0$$

$$\text{Step 3. } i = 1, \quad w = (-1/6, 1/3)^\top,$$

$$Aw = (-1, 0, 9/6, 1/6, -1/3)^\top \not\leq 0,$$

$$\text{Step 4. } \lambda = \min \left\{ \frac{2 - (-7)}{9/6}, \frac{0 - (-3)}{1/6} \right\} = 6, \quad j = 3,$$

$$\text{Step 5. } I = \{2, 3\}, \quad x = (3, 4)^\top + 6(-1/6, 1/3)^\top = (2, 6)^\top.$$



Iteration 4

$$x = (2, 6)^\top, \quad I = \{2, 3\}$$

Step 2. $A_I = \begin{pmatrix} 2 & 1 \\ -5 & 2 \end{pmatrix}, \quad A_I^{-1} = \frac{1}{9} \begin{pmatrix} 2 & -1 \\ 5 & 2 \end{pmatrix},$

$$c^\top A_i^{-1} = (7/9, 1/9)^\top,$$

$$y = (0, 7/9, 1/9, 0, 0)^\top, \quad y \geq 0,$$

$$\text{return } x = (2, 6)^\top \text{ and } y = (0, 7/9, 1/9, 0, 0)^\top.$$