SIMPLEX METHOD-1

$$\begin{bmatrix} -1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

one B

basic soln. get 1

$^5C_3 = 10$

you can get other basic solns. 5 are there

rest are infeasible.

$2x_1 + 5x_2 = 8 \quad \leftarrow 2$

$2x_1 + x_2 = 4$

$10x_2 = 16$

$-x_2$

$9x_2 = 16$

$x_2 = 4/9$

$x_2 = 2/3$

$2x_1 = 4 - \frac{2}{3}$

$x_1 = 2 - \frac{1}{3} = 5/3$

$$\begin{bmatrix} 1 & 5 & 1 & 0 \\ 2 & 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

$x_3 = 5$, $x_4 = 4$

$x_1 = 0$ $x_2 = 0$.

$$\begin{bmatrix} 1 & 5 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix} \Rightarrow (5/3, 2/3)$$

$$\begin{bmatrix} 5 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$$

$5x_2 + x_3 = 5$

$x_2 = 4$

$20 + x_3 = 5$

$x_3 = -15$ ✗ not feasible.

$$\begin{bmatrix} x_p \\ \hline 0 \end{bmatrix} = \theta \begin{bmatrix} p_b \\ \hline 0 \end{bmatrix} + (1-\theta) \begin{bmatrix} q_B \\ \hline 0 \end{bmatrix}$$

Choose basic variable.

Solve $Bx = b$.

$\binom{n+m}{m}$ times.

simplex algorithm

go from ~~edge~~ vertex to v. as long as you get better, soln.

and ivar to B, remove i.

$x_3 = 1 + x_1 - x_2$ $\quad x_1 \geq 3$

$x_4 = 3 - x_1$

$x_5 = 2 - x_2$ $\quad x_2 \geq 1$

bring x_2 to B.

$x_2 = 1 + x_1 - x_3$

$x_4 = 3 - x_1$

$x_5 = 2 - (1 + x_1 - x_3)$

$= 1 - x_1 + x_3$

$z = -x_1 - (1 + x_1 - x_3)$

$= -1 - 2x_1 + x_3$

$B = \{x_2, x_4, x_5\}$.

$$\begin{bmatrix} 0 \\ 1 \\ 0 \\ 3 \\ 2 \end{bmatrix} \quad z = -1$$

$x \leq 1$

Bring x_1 to B.

$x_1 = 1 + x_3 - x_5$

$x_2 = 2 - x_5$

$x_4 = 2 - x_3 + x_5$

$z = -1 - 2(1 + x_3 - x_5) + x_3$

$= -3 - x_3 + 2x_5$

$B = \{x_2\ x_3\ x_5\}$

bring x_3 to B

$x_3 = 2 - x_4 + x_5$

$x_1 = 3 - x_4$

$x_2 = 2 - x_5$

x_1	3
x_2	2
x_3	2

$z = -5 + x_4 + x_5$.

$z = -5$. ↳ no possibility of further improving objective

0
ε
5

$z = -5$.