$c_1 = -10 \quad c_2 = -20 \quad c_3 = 0 \quad c_4 = 0 \quad c_5 = 0$

$$A = \begin{pmatrix} -1 & 2 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 5 & 3 & 0 & 0 & 1 \end{pmatrix} \qquad b = \begin{pmatrix} 15 \\ 12 \\ 45 \end{pmatrix} \qquad x_B = \begin{pmatrix} x_3 \\ x_4 \\ x_5 \end{pmatrix}$$

Select x_3 x_4 x_5 as basic variables.

$$x_B = b \qquad x_B = \begin{pmatrix} 15.00 \\ 12.00 \\ 45.00 \end{pmatrix}$$

$$x_3 = x_{B_1} \qquad x_4 = x_{B_2} \qquad x_5 = x_{B_3}$$

$$x_1 = 0 \qquad x_2 = 0$$

Form matrix B_inv $B\_inv = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ $c_B = \begin{pmatrix} c_3 & c_4 & c_5 \end{pmatrix}$

$$a_1 = \begin{pmatrix} -1 \\ 1 \\ 5 \end{pmatrix} \quad a_2 = \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix} \quad a_3 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad a_4 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \quad a_5 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$$w = c_B \times B\_inv \qquad w = (0.00 \quad 0.00 \quad 0.00) \qquad z = w \times b$$

$$z_1 = w \times a_1 \qquad z_1 - c_1 = 10.00$$

$$z_2 = w \times a_2 \qquad z_2 - c_2 = 20.00$$

Since, $z_2 - c_2 = 20.00$ is most positive, x_2 will enter solution

Calculate y_2

$$y_2 = B\_inv \times a_2 \qquad y_2 = \begin{pmatrix} 2.00 \\ 1.00 \\ 3.00 \end{pmatrix}$$

Also, find new values of b; $b_n = B\_inv \times b \quad b_n = \begin{pmatrix} 15.00 \\ 12.00 \\ 45.00 \end{pmatrix}$

$$RHS\_vec = \begin{pmatrix} 0.00 \\ 15.00 \\ 12.00 \\ 45.00 \end{pmatrix} \qquad col\_vec = \begin{pmatrix} 20.00 \\ 2.00 \\ 1.00 \\ 3.00 \end{pmatrix} \qquad ratio = \begin{pmatrix} 7.50 \\ 12.00 \\ 15.00 \end{pmatrix}$$

Minimum ratio value = 7.5

x_3 will leave basic solution. pivot on cell (1,5);

	w1	**w2**	**w3**	**RHS**	**y2**
w	0	0	0	0	20
x3	1	0	0	15	2
x4	0	1	0	12	1
x5	0	0	1	45	3

After Pivot operations, updated Table is

	w1	w2	w	**RHS**
w	-10	0	0	-150
x2	0.5	0	0	7.5
x4	-0.5	1	0	4.5
x5	-1.5	0	1	22.5

$$w = (-10 \;\; 0 \;\; 0) \qquad c_B = \begin{pmatrix} c_2 & c_4 & c_5 \end{pmatrix}$$

New matrix is $B\_inv = \begin{pmatrix} 0.5 & 0 & 0 \\ -0.5 & 1 & 0 \\ -1.5 & 0 & 1 \end{pmatrix}$

$b_n = B\_inv \times b$ $\quad b_n = \begin{pmatrix} 7.50 \\ 4.50 \\ 22.50 \end{pmatrix}$

$z_1 = w \times a_1$ $\quad z_1 - c_1 = 20.00$

Since, $z_1 - c_1 = 20.00$ is most positive, x_1 will enter solution

Calculate y_1

$y_1 = B\_inv \times a_1$ $\quad y_1 = \begin{pmatrix} -0.50 \\ 1.50 \\ 6.50 \end{pmatrix}$

Also, find new values of b; $b_n = B\_inv \times b$ $\quad b_n = \begin{pmatrix} 7.50 \\ 4.50 \\ 22.50 \end{pmatrix}$

$RHS\_vec = \begin{pmatrix} -150.00 \\ 7.50 \\ 4.50 \\ 22.50 \end{pmatrix}$ $\quad col\_vec = \begin{pmatrix} 20.00 \\ -0.50 \\ 1.50 \\ 6.50 \end{pmatrix}$ $\quad ratio = \begin{pmatrix} -15.00 \\ 3.00 \\ 3.46 \end{pmatrix}$

Minimum positive ratio value = 3

x_4 will leave basic solution. pivot on cell (2,5);

	w1	w2	w	**RHS**	y1
w	-10	0	0	-150	20
x2	0.5	0	0	7.5	-0.5
x4	-0.5	1	0	4.5	1.5
x5	-1.5	0	1	22.5	6.5

After pivoting; new Table

	w1	w2	w3	RHS	y1
w	-3.333	-13.333	0.000	-210.000	0.000
x2	0.333	0.333	0.000	9.000	0.000
x1	-0.333	0.667	0.000	3.000	1.000
x5	0.667	-4.333	1.000	3.000	0.000

$c_B = \begin{pmatrix} c_2 & c_1 & c_5 \end{pmatrix}$ $\quad w = (-3.333 \quad -13.333 \quad 0)$

$$B\_inv = \begin{pmatrix} 0.333 & 0.333 & 0 \\ -0.333 & 0.667 & 0 \\ 0.667 & -4.333 & 1 \end{pmatrix} \qquad b_n = B\_inv \times b \qquad b_n = \begin{pmatrix} 8.99 \\ 3.01 \\ 3.01 \end{pmatrix}$$

OPTIMALITY TEST: $z_0 = c_B \times b_n$ $\quad z_0 = -209.91$

$z_1 = w \times a_1 \qquad z_1 - c_1 = 0.00$

$z_2 = w \times a_2 \qquad z_2 - c_2 = 0.00$

$z_3 = w \times a_3 \qquad z_3 - c_3 = -3.33$

$z_4 = w \times a_4 \qquad z_4 - c_4 = -13.33$

$z_5 = w \times a_5 \qquad z_5 - c_5 = 0.00$

Since, all $z_j - c_j < 0$ we have optimal solution at hand...