

3.

maximize $z = 3x_1 + 2x_2$
subject to,

$$x_1 \leq 4$$

$$x_1 + 3x_2 \leq 15$$

$$2x_1 + x_2 \leq 10$$

and

$$x_1 \geq 0, \quad x_2 \geq 0$$

Solution:

$$(0) \quad z - 3x_1 - 2x_2 = 0$$

$$(1) \quad x_1 + x_3 = 4$$

$$(2) \quad x_1 + 3x_2 + x_4 = 15$$

$$(3) \quad 2x_1 + x_2 + x_5 = 10$$

Iteration	Basic variable	Eq	Coefficient of					Right side	Ratio
			z	x_1	x_2	x_3	x_4	x_5	
0	z	(0)	1	-3	-2	0	0	0	
	x_3	(1)	0	1	0	1	0	0	$4/1 = 4$
	x_4	(2)	0	1	3	0	1	0	$15/1 = 15$
	x_5	(3)	0	2	1	0	0	1	$10/2 = 5$
1	z	(0)	1	0	-2	3	0	0	12
	x_1	(1)	0	1	0	1	0	0	4
	x_4	(2)	0	0	3	-1	1	0	11
	x_5	(3)	0	0	1	-2	0	1	2
2	z	(0)	1	0	0	-1	0	2	16
	x_1	(1)	0	1	0	1	0	0	4
	x_4	(2)	0	0	0	5	1	-3	5
	x_2	(3)	0	0	1	-2	0	1	2
3	z	(0)	1	0	0	0	$\frac{1}{5}$	$\frac{7}{5}$	17
	x_1	(1)	0	1	0	0	$-\frac{1}{5}$	$\frac{3}{5}$	3
	x_3	(2)	0	0	0	1	$\frac{1}{5}$	$-\frac{3}{5}$	1
	x_2	(3)	0	0	1	0	$\frac{2}{5}$	$-\frac{1}{5}$	4

Maximize, $z = 17$

$$x_1 = 3$$

$$x_2 = 4$$

1. Maximize , $Z = 3x_1 + 5x_2$ subject to

$$x_1 \leq 4$$

$$2x_2 \leq 12$$

$$3x_1 + 2x_2 \leq 18$$

$$x_1 \geq 0 \quad x_2 \geq 0$$

$$(0) \quad Z - 3x_1 - 5x_2 =$$

$$x_1 + x_3 = 12$$

$$2x_2 + x_4 = 12$$

$$3x_1 + 2x_2 + x_5 = 18$$

$$= 0$$

$$= 4$$

$$= 12$$

$$= 18$$

iteration	Basic variable	Eq	Z	x_1	x_2	x_3	x_4	x_5	RS
0	Z	(0)	1	-3	-5	0	0	0	0
	x_3	(1)	0	1	0	1	0	0	4
	x_4	(2)	0	0	2	0	1	0	12
	x_5	(3)	0	3	2	0	0	1	18
1	Z	(0)	1	-3	0	0	5/2	0	30
	x_3	(1)	0	1	0	1	0	0	4
	x_2	(2)	0	0	1	0	1/2	0	6
	x_5	(3)	0	3	0	0	-1	1	6
2	Z	(0)	1	0	0	0	3/2	1	36
	x_3	(1)	0	0	0	1	1/3	-1/3	2
	x_2	(2)	0	0	1	0	1/2	0	6
	x_1	(3)	0	1	0	0	-1/3	1/3	2

So, maximize

$$Z = 36$$

$$x_1 = 2$$

$$x_2 = 6$$

0	5	0	$\frac{5}{2}$	0	30
-3	-5	0	0	0	0
<hr/>					
-3	0	0	$\frac{5}{2}$	0	30

0	-2	0	-1	0	-12
3	2	0	0	1	18
<hr/>					
3	0	0	-1	1	6

3	0	0	-1	1	6
-3	0	0	$\frac{5}{2}$	0	30
<hr/>					
0	0	0	$\frac{3}{2}$	1	36

-1	0	0	$\frac{1}{3}$	$-\frac{1}{3}$	-2
1	0	1	0	0	4
<hr/>					
0	0	1	$\frac{1}{3}$	$-\frac{1}{3}$	2

2. Maximize, $Z = 3x_1 + 2x_2$

subject to,

$$2x_1 + x_2 \leq 6$$

$$x_1 + 2x_2 \leq 6$$

And $x_1 \geq 0, x_2 \geq 0$

(0) $Z - 3x_1 - 2x_2 = 0$

(1) $2x_1 + x_2 + x_3 = 6$

(2) $x_1 + 2x_2 + x_4 = 6$

iteration	Basic Variable	Eq	Z	x_1	x_2	x_3	x_4	Rs
0	Z	(0)	1	-3	-2	0	0	0 = 0
	x_3	(1)	0	2	1	1	0	6 = 3
	x_4	(2)	0	1	2	0	1	6 = 6
1	Z	(0)	1	0	$-\frac{1}{2}$	$\frac{3}{2}$	0	9
	x_1	(1)	0	1	$\frac{1}{2}$	$\frac{1}{2}$	0	3 = 6
	x_4	(2)	0	0	$\frac{3}{2}$	$-\frac{1}{2}$	1	3 = 2
2	Z	(0)	1	0	0	$-\frac{4}{3}$	$\frac{1}{3}$	10
	x_1	(1)	0	1	0	$\frac{2}{3}$	$-\frac{1}{3}$	2
	x_2	(2)	0	0	1	$-\frac{1}{3}$	$\frac{2}{3}$	2

So,

maximize,

$$Z = 10$$

$$x_1 = 2$$

$$x_2 = 2$$

(Ans)

answer 2 :

$$\begin{pmatrix} 1 & 1/2 & 1/2 & 0 & 3 \end{pmatrix} \times 3$$

$$= \begin{pmatrix} 3 & 3/2 & 3/2 & 0 & 9 \end{pmatrix}$$

$$\begin{pmatrix} -3 & -2 & 0 & 0 & 0 \end{pmatrix}$$

$$\hline \begin{pmatrix} 0 & -1/2 & 3/2 & 0 & 9 \end{pmatrix}$$

$$\begin{pmatrix} -1 & -1/2 & -1/2 & 0 & -3 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 & 1 & 6 \end{pmatrix}$$

$$\hline \begin{pmatrix} 0 & 3/2 & -1/2 & 1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & -1/3 & \frac{2}{3} & 2 \end{pmatrix} \times \frac{1}{2} - 3$$

$$\begin{pmatrix} 0 & 1/2 & -1/6 & \frac{1}{3} & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & -1/2 & 3/2 & 0 & 9 \end{pmatrix}$$

$$\hline \begin{pmatrix} 0 & 0 & 4/3 & 1/3 & 10 \end{pmatrix} \rightarrow 1$$

$$\begin{pmatrix} 0 & -1/2 & 1/6 & -1/3 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 1/2 & 1/2 & 0 & 3 \end{pmatrix}$$

$$\hline \begin{pmatrix} 1 & 0 & 2/3 & -1/3 & 2 \end{pmatrix}$$

(Rough)

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x_1 replacing x_3

3 Rough

3 No question

(0)

3	0	3	0	0	12
-3	-2	0	0	0	0
0	-2	3	0	0	12

(2)

-1	0	-1	0	0	-4
1	3	0	1	0	15
0	3	-1	1	0	11

(3)

-2	0	-2	0	0	-8
2	1	0	0	1	10
0	1	-2	0	1	2

x_2 replacing x_5

$$\begin{array}{cccccc|c} 0 & 2 & -4 & 0 & 2 & 4 \\ 0 & -2 & 3 & 0 & 0 & 12 \\ \hline 0 & 0 & -1 & 0 & 2 & 16 \end{array}$$

①

$$\begin{array}{cccccc|c} 0 & -3 & -6 & 0 & -3 & -6 \\ 0 & 3 & -1 & 1 & 0 & 11 \\ \hline 0 & 0 & 5 & 1 & -3 & 5 \end{array}$$

②

x_3 replacing x_4

$$\begin{array}{ccccc|c} 0 & 0 & 1 & \frac{1}{5} & -\frac{3}{5} & 1 \end{array}$$

②

$$\begin{array}{cccccc|c} 0 & 0 & 2 & \frac{2}{5} & -\frac{6}{5} & 2 \\ 0 & 1 & -2 & 0 & 1 & 2 \\ \hline 0 & 1 & 0 & \frac{2}{5} & -\frac{1}{5} & 4 \end{array}$$

③

$$\begin{array}{cccccc|c} 0 & 0 & -1 & -\frac{1}{5} & +\frac{3}{5} & -1 \\ 1 & 0 & 1 & 0 & 0 & 4 \end{array}$$

①

$$\begin{array}{cccccc|c} 1 & 0 & 0 & -\frac{1}{5} & \frac{3}{5} & 3 \end{array}$$

$$\begin{array}{c}
 \begin{array}{cccccc|c}
 0 & 0 & 1 & \frac{1}{5} & -\frac{3}{5} & 1 \\
 0 & 0 & -1 & 0 & 2 & 16
 \end{array} \\
 \hline
 (b) \begin{array}{cccccc|c}
 0 & 0 & 0 & \frac{1}{5} & \frac{7}{5} & 12
 \end{array}
 \end{array}$$