

19/6/26

Unit - I.

Solve Graphically. (Only 2 Variable).

1) Max $Z = 3x_1 + 4x_2 \rightarrow$ Objective function.
Sub to,

$$\left. \begin{array}{l} 2x_1 + 5x_2 \leq 120 \\ 4x_1 + 2x_2 \leq 80 \end{array} \right\} \text{Constraints.}$$

$$x_1, x_2 \geq 0.$$

$$2x_1 + 5x_2 = 120.$$

$$4x_1 + 2x_2 = 80$$

x_1	0	60
x_2	24	0

x_1	0	20
x_2	40	0

OABC is a feasible region.

Points

$$Z = 3x_1 + 4x_2$$

$$O(0,0) = Z = 0$$

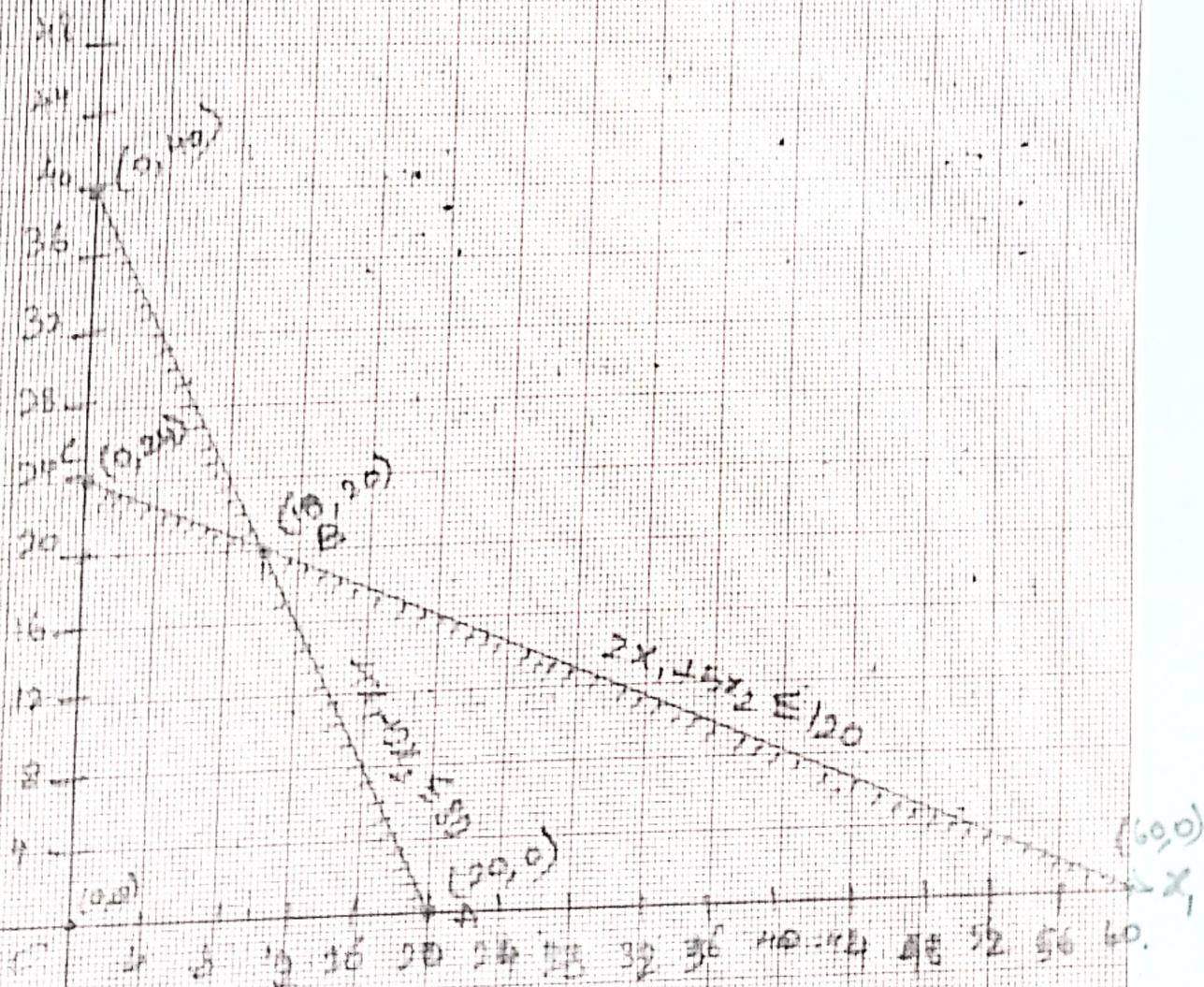
$$A(20,0) = Z = 3(20) + 0 = 60$$

$$B(10,20) = Z = 3(10) + 4(20) = 30 + 80 = 110$$

$$C(0,24) = Z = 0 + 4(24) = 96.$$

$$\therefore Z(\max) = 110 \text{ at } x_1 = 10, x_2 = 20.$$

x_2



⑦ Solve graphically

$$\min Z = 5x_1 + 4x_2$$

$$\text{Sub to } 4x_1 + x_2 \geq 40 \quad \times 3.$$

$$2x_1 + 3x_2 \geq 90 \quad \times 2.$$

$$x_1, x_2 \geq 0.$$

$$4x_1 + x_2 = 40$$

x_1	0	10
x_2	40	0

$$2x_1 + 3x_2 = 90$$

x_1	0	45
x_2	30	0

$$4x_1 + x_2 = 40.$$

$$11x_2 = 180$$

$$\begin{array}{r} (-) \quad (-) \quad (-) \\ \hline \end{array}$$

$$-5x_2 = -140.$$

$$x_2 = \frac{-140}{-5} = 28.$$

$$4x_1 + 28 = 40$$

$$4x_1 = 40 - 28 = 12$$

$$x_1 = \frac{12}{4} = 3.$$

$$\text{Points } Z = 5x_1 + 4x_2$$

$$A(45, 0) = 225$$

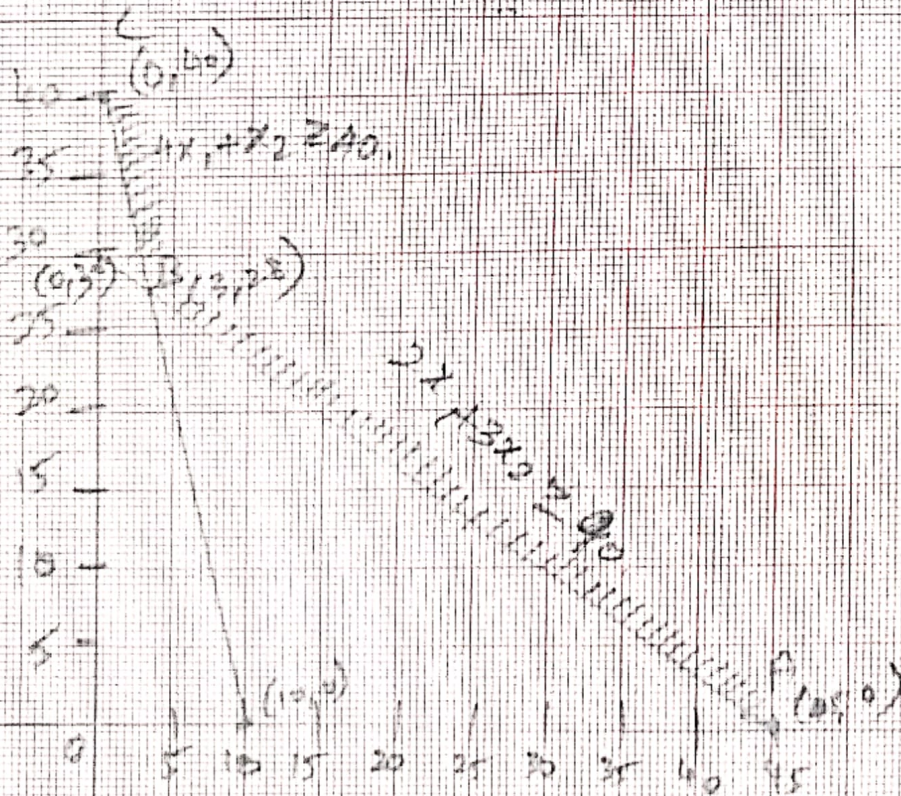
$$B(3, 28) = 15 + 112 = 127$$

$$C(0, 40) = 4(40) = 160$$

$$\min Z = 127 \text{ (optimal value)} \\ \text{at } x_1 = 3, x_2 = 28.$$

x₂

↑



$$\min Z = 2x - y \quad (\text{Dec 2021})$$

$$x + y \leq 5, \quad x + 2y \geq 8.$$

13)

$$x + y = 5, \quad x + 2y = 8.$$

x	0	5
y	5	0

x	0	8
y	4	0

ABC is a feasible region.
 $Z = 2x - y$

$$A(0, 4) = -4$$

$$B(2, 3) = 2(2) - 3 = 1$$

$$C(0, 5) = -5.$$

$$\min Z = -5, \quad x_1 = 0, \quad x_2 = 5.$$

10
9
8
7
6
5
4
3
2
1

(0,5)

(0,4)

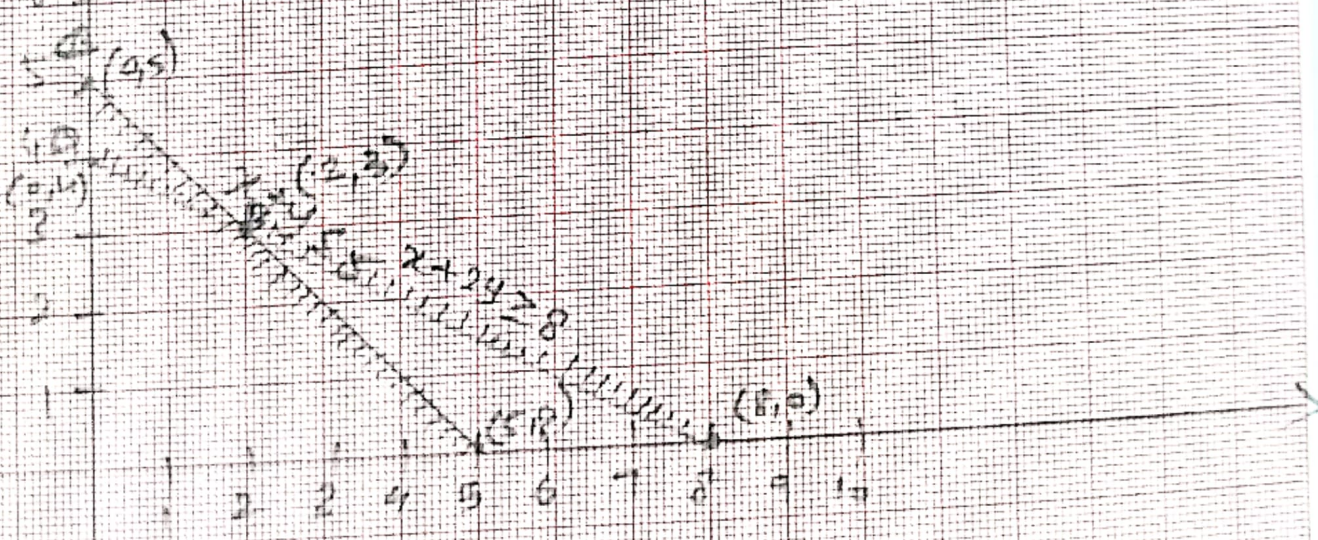
(2,3)

$x + 2y \geq 8$

(5,0)

(8,0)

2 3 4 5 6 7 8 9 10



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May 2023.

13) Min $Z = 3x_1 + 2x_2$ Solve Graphically.
 Subject to $5x_1 + x_2 \geq 10$
 $x_1 + x_2 \geq 6$
 $x_1 + 4x_2 \geq 12$
 $x_1, x_2 \geq 0$.

$$5x_1 + x_2 = 10$$

x_1	0	2
x_2	10	0

$$x_1 + x_2 = 6$$

x_1	0	6
x_2	6	0

$$x_1 + 4x_2 = 12$$

x_1	0	12
x_2	3	0

$$5(1.5) + 2.5 = 10.$$

$$7.5 + 2.5 = 10.$$

Points at ABC.

$$Z = 3x_1 + 2x_2$$

$$A(12, 0) \quad Z = 3(12) = 36.$$

$$B(1.5, 2.5) \quad Z = 3(1.5) + 2(2.5) = 4.5 + 5 = 9.5$$

$$C(0, 10) \quad Z = 2(10) = 20.$$

$$\therefore \text{Min } Z = 9.5 \text{ at } x_1 = 1.5, x_2 = 2.5.$$

x_2



12

11

10 $(0, 10)$

9

8

7

6

5

4

3

2

1

0

-1

-2

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