Unit-I

Graphical method.

Solve

$$\max Z = 5x+7y$$

subject to

$$12x+12y \leq 840$$

$$3x+6y \leq 300$$

$$8x+4y \leq 480$$

$$x \geq 0,\ y \geq 0$$

$8x+4y=480$.

Soln

~~$12x+12y=840$~~ ~~If $x=0 \Rightarrow y=120$~~

$(0,120)$

~~If $y=0 \Rightarrow x=60$~~

$(60,0)$

Soln

$12x+12y=840$

If $x=0 \Rightarrow 12y=840$

$y=70$ $(0,70)$

x,y

If $y=0 \Rightarrow (70,0)$

I st constrain pt, $\{(0,70),(70,0)\}$

$3x+6y=300$

If $x=0 \Rightarrow y \leq 50$ $(0,50)$

If $y=0 \Rightarrow x=100$

$(100,0)$

$12x + 12y = 840 \longrightarrow (1)$

$3x + 6y = 300 \longrightarrow (2)$

$2 \times 2 \Rightarrow 6x + 12y = 600$

$(1) \Rightarrow 12x + 12y = 840$

$-6x = -240$

put $x = 40$ in (2)

$120 + 6y = 300$

$6y = 180$

$y = 30$

$(40, 30)$

$8x + 4y = 480 \quad -(1)$

$12x + 12y = 840 \quad -(2)$

(1) × (2)

$24x + 12y = 1440$

$-12x = -600$

put $x = 50$ in (1)

$400 + 4y = 480$

$4y = 80$

$y = 20$

Points	$Z = 5x + 7y$
$(0, 0)$	0
$(0, 50)$	350
$(40, 30)$	410
$(50, 20)$	390
$(60, 0)$	300

Given l.p.p has maximum at $(40, 30)$ & maximum value is 410.

Solve $\min Z = x_1 + x_2$

$x_1 + x_2 \geq 1$

$3x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

$x_1 + x_2 = 1$

If $x_1 = 0 \Rightarrow x_2 = 1$

$(0, 1)$

If $x_2 = 0 \Rightarrow x_1 = 1$

$(1, 0)$

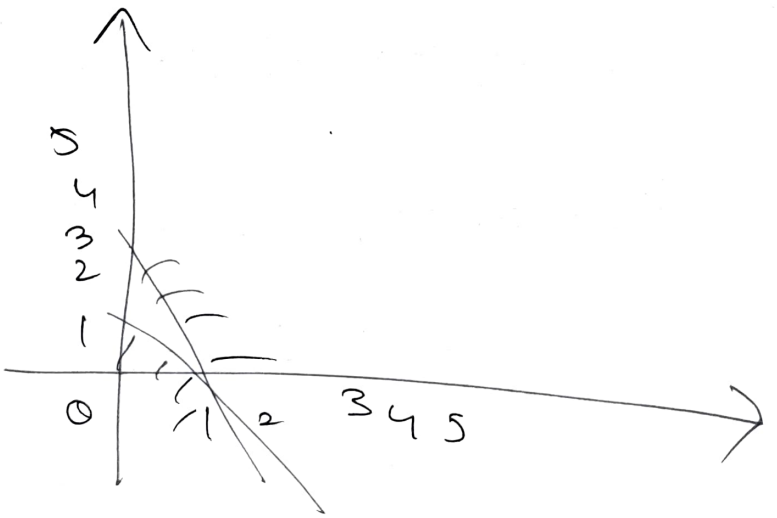
$3x_1 + x_2 = 3$

If $x_1 = 0 \Rightarrow x_2 = 3 \; (0, 3)$

If $x_2 = 0 \Rightarrow x_1 = 1 \; (1, 0)$.

Since there is no common region.

So there is no feasible solution.



Solve

a) minimize $z = 4x_1 + x_2$

b) maximize $z = 4x_1 + x_2$

Subject to,

$3x_1 + 4x_2 \geq 20$

$-x_1 - 5x_2 \leq -15$

$x_1, x_2 \geq 0.$

$3x_1 + 4x_2 = 20.$

If $x_1 = 0 \Rightarrow x_2 = 5 \; (0, 5)$

If $x_2 = 0 \Rightarrow x_1 = 20/3 \; (20/3, 0)$

$-x - 5x_2 = -15$

If $x_1 = 0 \Rightarrow x_2 = 15 \; (0, 3)$

If $x_2 = 0 \Rightarrow x_1 = 15 \; (15, 0).$

$3x_1 + 4x_2 = 20$

$-3x_1 - 15x_2 = -45$

$-11x_2 = -25 \Rightarrow x_2 = 25/11$

$-x_1 - 5(25/11) = -15$

$x_1 = -15 + \frac{125}{11} = \frac{-165 + 125}{11} = \frac{-40}{10}$

a) Points $z = 4x_1 + x_2$

$(0, 5)$ $\quad 5$

$\left(\frac{40}{11}, \frac{25}{11}\right)$ $\quad 185/11.$

$(15, 0)$ $\quad 60$

b) R^+ has unbounded region.