

20/09/17

SBG STUDY

* Linear Programming *

Q A Dealer can invest 50,000 Rs maximum
We have only ~~disposal~~^{storage} place of 60 pieces
of chair or table

Cost of chair = 500

and profit per chair is 75 Rs.

Cost of table is 2500

and profit per table is 250 Rs find

max. Profit we can earn.

$$x \text{ — table} \quad x \geq 0 \text{ — (1)}$$

$$y \text{ — Chairs} \quad y \geq 0 \text{ — (2)}$$

$$2500x + 500y \leq 50000 \text{ (Investment Constraint)}$$

$$5x + y \leq 100 \text{ — (3)}$$

$$x + y \leq 60 \text{ (Storage Constraint)}$$

— (4)

$$\text{Profit} \Rightarrow Z$$

↑
maximize

$$= 2500x + 75y \text{ — (5)}$$

Constraints!

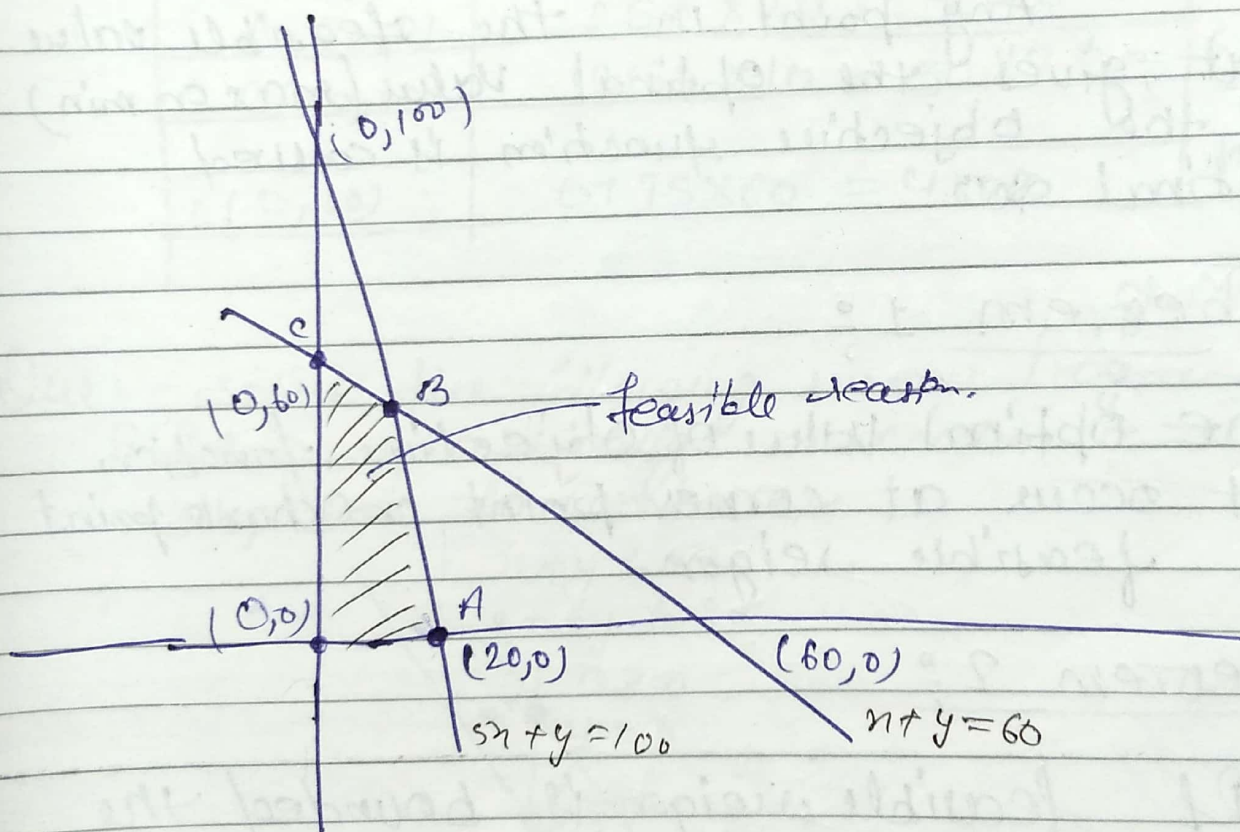
The linear inequalities or eq^y of first restriction on the variable of a linear programming are called Constraint constraints.

eqⁿ 1 to 4 is our constraints.

* Objective function:

Linear fⁿ $z = ax + by$ where a, b are constants which has to be maximize or minimized is called objective function, here eqⁿ 5 is a objective function.

x, y are called decision variables.



* feasible region!

The Common Region determined by all the constraint is called feasible region.

When $OABC$ is our feasible region

* feasible solⁿ,

Points within and on the feasible region are called feasible solⁿ

* optimal solⁿ!

Any point in the feasible value that gives the optimal value (max or min) of the objective function is called optimal solⁿ.

* Theorem 1 :

The optimal value of objective function must occur at corner point or sharp point of feasible region

* Theorem 2 :

If feasible region is bounded the objective function has both max. and minimum value which occur at corner points.

* If ~~the~~ feasible region is unbounded the optimal solⁿ may not exist

If it exist then we have to check its Credibility.

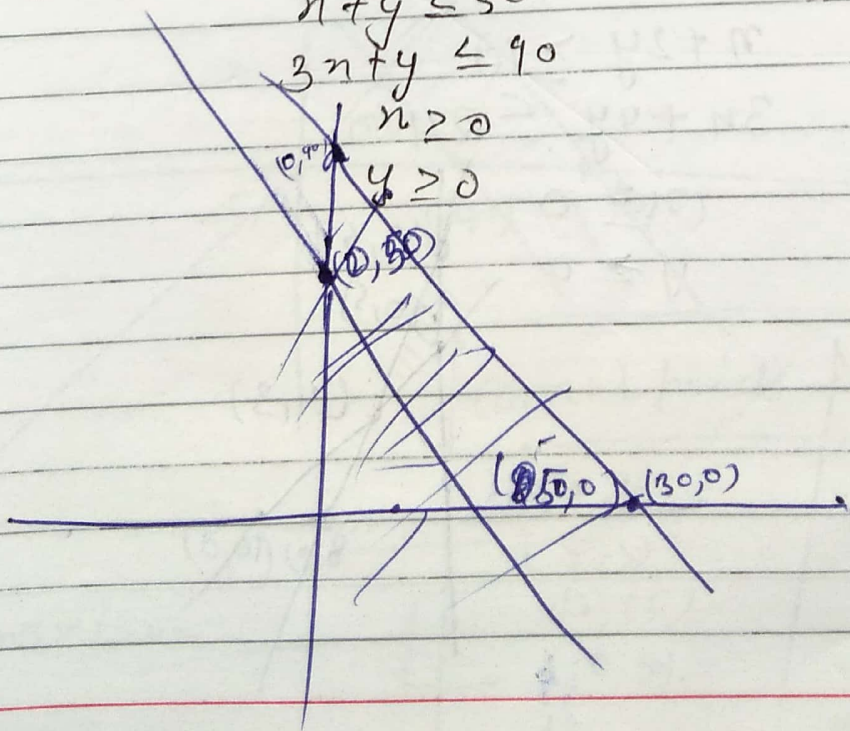
Optimal solution must not have common solⁿ with feasible region otherwise it doesn't exist

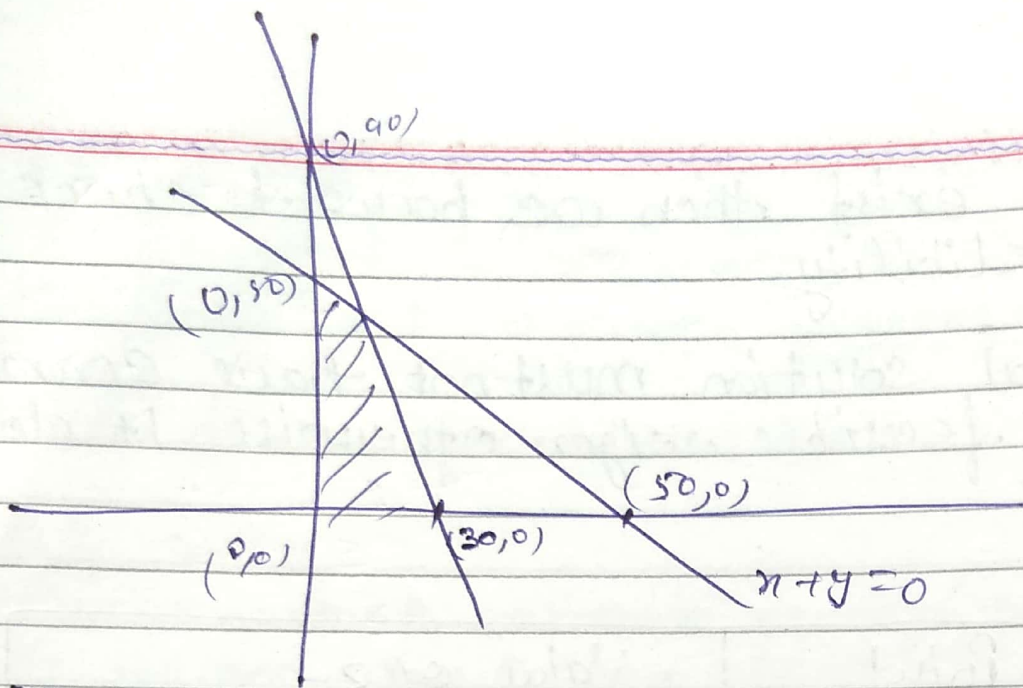
Point	Value of z
O (0,0)	0
A (20,0)	$250 \times 20 = 5000$
B (10,50)	$250 \times 10 + 50 \times 75 = 6250$
C (0,60)	$0 + 75 \times 60 = 4500$

\downarrow
 max value
 optimal solⁿ

Ques: solve the following linear programming problem graphically maximum $z = 4x + y$ subjected to constraints

$$\begin{aligned}
 x + y &\leq 50 \\
 3x + y &\leq 90 \\
 x &\geq 0 \\
 y &\geq 0
 \end{aligned}$$





	val of z
(0,0)	0
(30,0)	120
(20,30)	110
(0,50)	50

max of the sol

Ques: Solve the following linear programming problem minimize $Z = 200x + 500y$

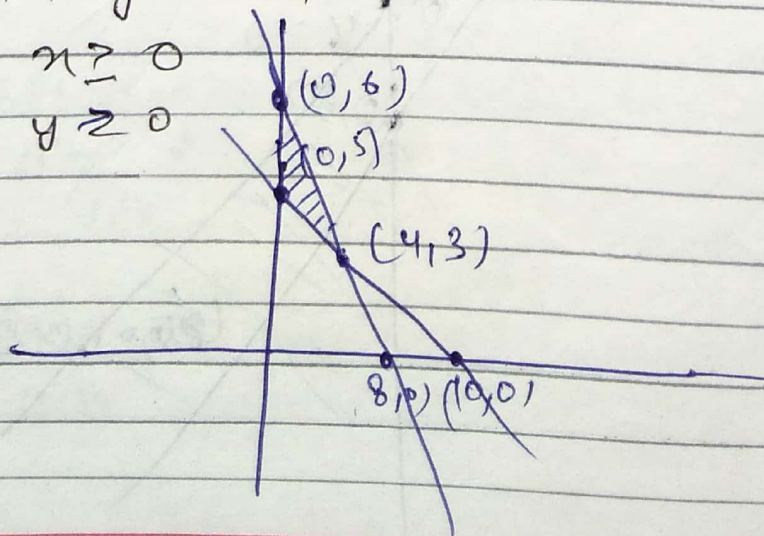
Subject to constraints

$$x + 2y \geq 10$$

$$3x + 4y \leq 24$$

$$x \geq 0$$

$$y \geq 0$$



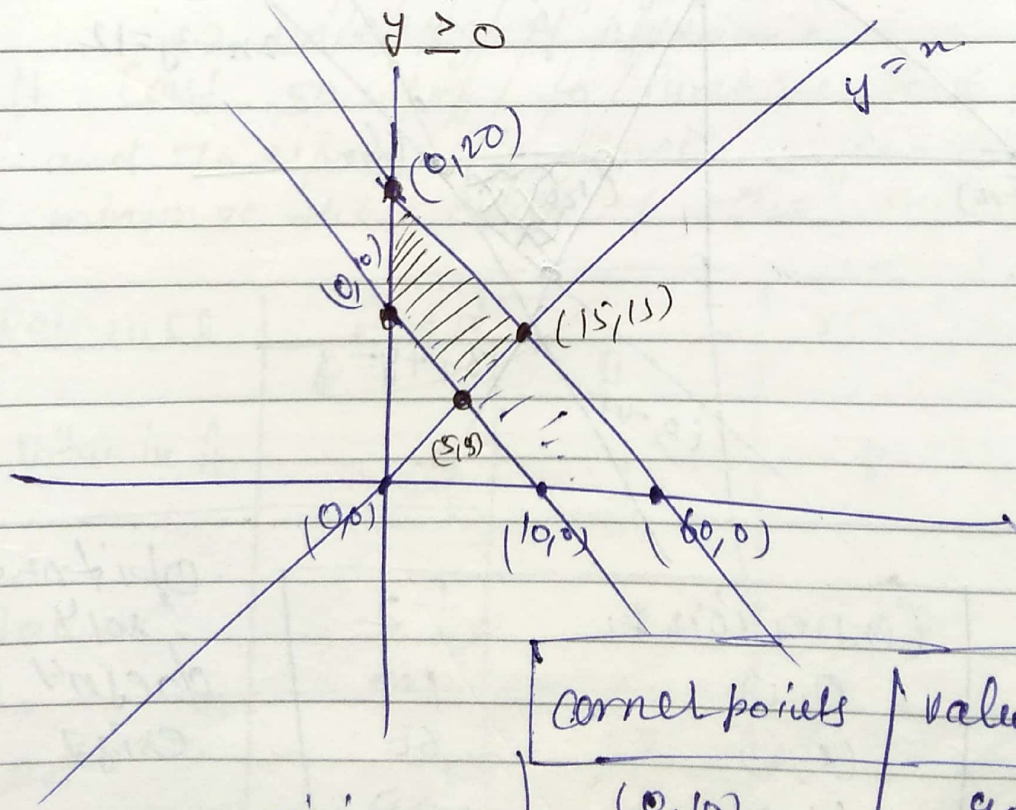
Corner points	Value of z
$(0, 5)$	2500
$(4, 3)$	2300
$(0, 6)$	3000

Q. $z = 3x + 4y$

constraints

$$\begin{aligned}
 x + 3y &\leq 60 \\
 x + y &\geq 10 \\
 x &\leq y \\
 x &\geq 0 \\
 y &\geq 0
 \end{aligned}$$

maximize and minimize



corner points	value of z
$(0, 10)$	90
$(5, 5)$	60
$(15, 15)$	180
$(0, 20)$	180

minimum \leftarrow
maximum \leftarrow

Q.

$$z = -50x + 20y$$

minimize

Subject to Constraints

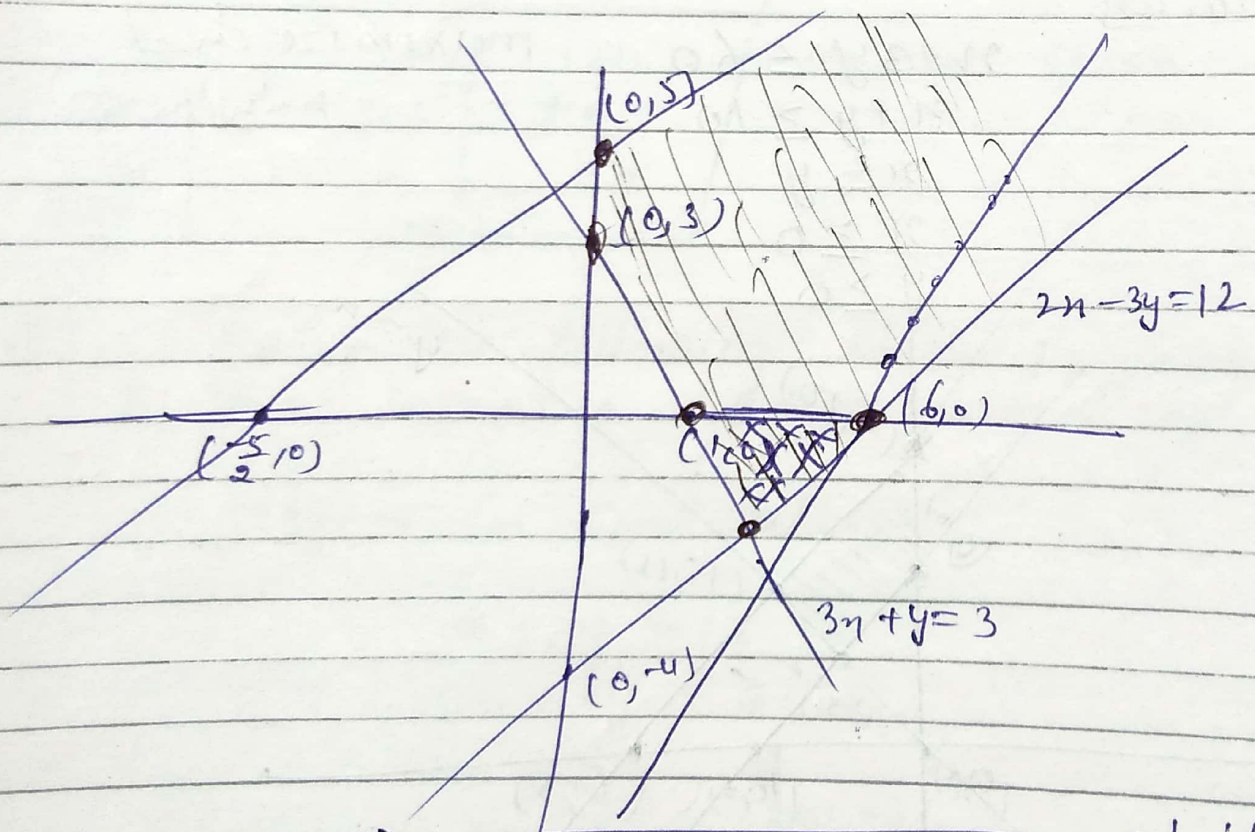
$$2x - y \geq -5$$

$$3x + y \geq 3$$

$$2x - 3y \leq 12$$

$$x \geq 0$$

$$y \geq 0$$



Corner Points	z
(0, 5)	100
(0, 3)	60
(1, 0)	-50
(6, 0)	-300

optimal
soln
doesn't
exist

$$Z = -300$$

$$-50x + 20y = -300$$

$$-5x + 2y = -30$$

$$5x - 2y = 30$$

☆☆
Sol:

A dietitian which mixed in such a way that vitamin contents of the mixture contains at least 8 unit of Vitamin A and 10 unit of Vitamin C. Food I contains 2 unit/kg of Vitamin A and 1 unit/kg of Vitamin C.

Food II contains 1 unit/kg of Vitamin A and 2 unit/kg of Vitamin B. It cost 50 rs/kg to purchase Food I and 70 rs/kg to purchase Food II. minimize the cost of the mixture.

Resource	Food		requirement
	I	II	
Vitamin A	2	1	8
Vitamin C	1	2	10
Cost	50	70	

Food I
Food II

$$x + y \geq 8$$

$$x + 2y \geq 10$$

$$\text{Cost} = z = 50x + 70y$$

$$x \geq 0$$

$$y \geq 0$$

Ans: 380

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