5.3. Linear Programming in 2 Dimensions

Wednesday, February 28, 2018 12:32 PM

Goal: Solve linear programming problems in 2 dimensions.

E.g. Small truck company.

	Capacity	Crew required	max # of trucks avail. a day
A	300 lbs	3	40
B	500 lbs	2	60

At most 180 truck operators a day.

x : # of trucks of type A to utilize a day

y : # _____ B _____

Q: How many trucks of type A and how many trucks of type B should be utilized to maximize the capacity.

Step 1: Write down a system of inequalities to describe all constraints of the problem.

Step 2: Solve the system to find the feasible region and corner points.

Step 3: Write an expression for the capacity of x trucks A and y trucks B.

Step 4: Plug the corner points into expression in 3 to determine the optimal solution.

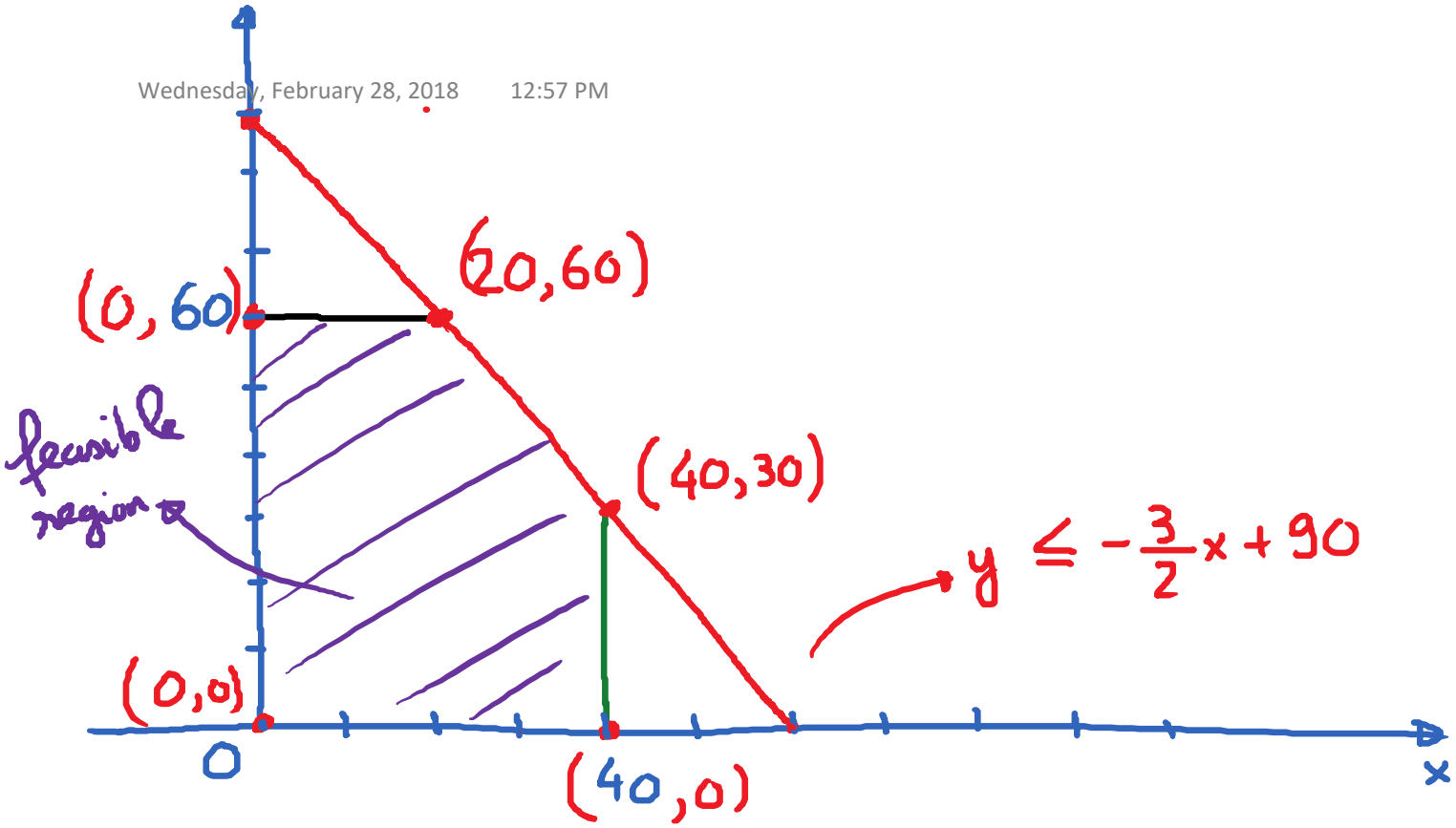
Step 1:

$$x \geq 0;\ y \geq 0$$
$$3x + 2y \leq 180$$
$$x \leq 40$$
$$y \leq 60$$

Constraints of problem.

Step 2: Find feasible region and corner points.

$$2y \leq -3x + 180$$
$$y \leq -\frac{3}{2}x + 90$$



(3) Maximize Capacity:

$$C = 300x + 500y$$

Capacity.

(4)

Corner point	$C = 300x + 500y$
(0,0)	0
(40,0)	12000
(0, 60)	30000
(40, 30)	27000
(20,60)	36000 → maximum.

Conclusion:
20 trucks of A
and
60 trucks of B

Linear Programming Technique to solve optimization problems with constraints

(1) Find the expression that describes the quantity you want to optimize.

(2) Find the system of inequalities that describe the constraints.

(3) Using the system in (2), find the feasible region and corner points.

(4) Plug the corner points into expression in (1) to find the optimal solution.