

# ASSIGNMENT 9

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Download all python codes from

<https://github.com/Y.Nagarani/ASSIGNMENT9/tree/main/CODES>

and latex-tikz codes from

<https://github.com/Y.Nagarani/ASSIGNMENT9/tree/main>

Now ,we have

$$\begin{pmatrix} -1 & -3 \\ -3 & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -12 \\ -12 \end{pmatrix} + \mathbf{u} \quad (2.0.6)$$

$$\mathbf{x} = \begin{pmatrix} -1 & -3 \\ -3 & -1 \end{pmatrix}^{-1} \begin{pmatrix} -12 \\ -12 \end{pmatrix} + \begin{pmatrix} -1 & -3 \\ -3 & -1 \end{pmatrix}^{-1} \mathbf{u} \quad (2.0.7)$$

$$\mathbf{x} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} - \frac{1}{8} \begin{pmatrix} -1 & 3 \\ 3 & -1 \end{pmatrix} \mathbf{u} \quad (2.0.8)$$

Thus , the solution of the system of inequalities can be determined graphically and the desired region is the shaded triangle which is represented in below fig 2.1

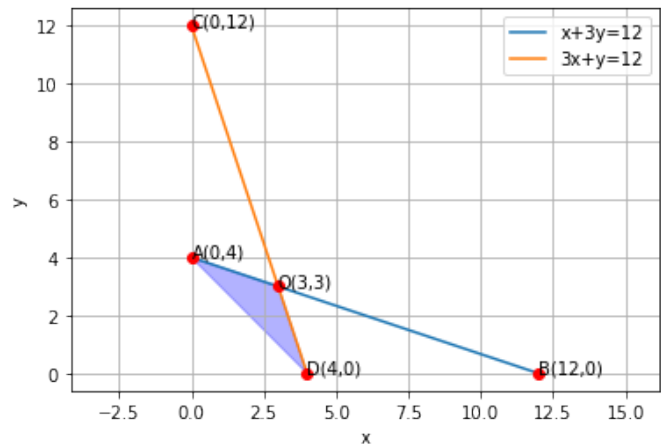


Fig. 2.1: Graphical Solution

## 1 QUESTION No 2.15

A manufacture produce nuts and bolts.It takes 1 hour of work on a machine A and 3 hours on machine B to produce a package of nuts.It takes 3 hours on machine A and 1 hour on machine B to produce a package of bolts. He earns a profit of Rs17.50 per package on nuts and Rs7.00 per package on bolts.How many packages of each should be produced each day so as to maximize his profit, if he operates his machines for at the most 12 hours a day

## 2 SOLUTION

Let,  $x$  = No.of packages of nuts.  
 $y$  = No.of packages of bolts.

$$x, y \geq 0 \quad (2.0.1)$$

And that is

$$x + 3y \leq 12 \quad (2.0.2)$$

$$3x + y \leq 12 \quad (2.0.3)$$

Which can be written as ,

$$\begin{pmatrix} -1 & -3 \\ -3 & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -12 \\ 12 \end{pmatrix} \quad (2.0.4)$$

Let,  $u_1 \geq 0, u_2 \geq 0$ . This may be expressed as ,

$$\mathbf{u} = \begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \geq \mathbf{0} \quad (2.0.5)$$

Now, we have to find profit maximum from graphical solution for nuts and bolts

Therefore , profit maximum

$$z = 17.5x + 7y \quad (2.0.9)$$

Corner points are  $A = (0, 4)$  ,  $O = (3, 3)$  and  $D = (4, 0)$

Intersecting of two lines at a point (3,3) and that is maximum point.

$$z = 17.53 + 73 = 73.5 \quad (2.0.10)$$

Therefore , maximum value of  $z$  is Rs73.5 if be produce and sell 3 units of nuts and 3 units of bolts.