ASSIGNMENT 8

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1 QUESTION No 2.49

Solve $x+y \geq 4$, $2x-y \leq 0$.

2 SOLUTION

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

$$\mathbf{u} = \begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \geq \mathbf{0} \qquad (2.0.1)$$

Now ,we have

$$\begin{pmatrix} 1 & 1 \\ -2 & 1 \end{pmatrix} \mathbf{x} \geq \begin{pmatrix} 4 \\ 0 \end{pmatrix} \qquad (2.0.2)$$

$$\begin{pmatrix} 1 & 1 \\ -2 & 1 \end{pmatrix} \mathbf{x} \geq \begin{pmatrix} 4 \\ 0 \end{pmatrix} + \mathbf{u} \qquad (2.0.3)$$

$$\mathbf{x} = \begin{pmatrix} 1 & 1 \\ -2 & 1 \end{pmatrix}^{-1} \begin{pmatrix} 4 \\ 0 \end{pmatrix} + \begin{pmatrix} 1 & 1 \\ -2 & 1 \end{pmatrix}^{-1} \mathbf{u} \qquad (2.0.4)$$

$$\mathbf{x} = \frac{1}{3} \begin{pmatrix} 4 \\ 8 \end{pmatrix} + \frac{1}{3} \begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix} \mathbf{u} \qquad (2.0.5)$$

$$\mathbf{x} = \begin{pmatrix} \frac{4}{3} \\ \frac{8}{3} \end{pmatrix} + \frac{1}{3} \begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix} \mathbf{u} \qquad (2.0.6)$$

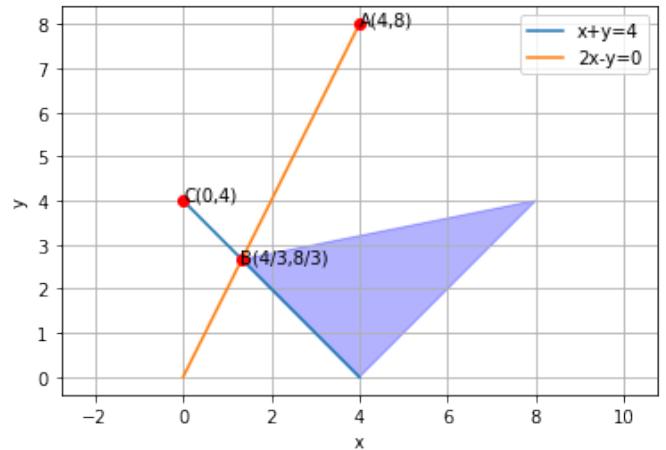Thus , the solution of the system of inequalities can be determined graphically and the desired region is the shaded triangle which is represented in below fig

Fig. 0: Graphical Solution