EE25BTECH11041 - Naman Kumar

Question:

Solve the linear equation:

$$6x + 3y = 6xy \tag{1}$$

1

$$2x + 4y = 5xy \tag{2}$$

Solution:

Dividing both equations with xy

$$\frac{6}{y} + \frac{3}{x} = 6\tag{3}$$

$$\frac{2}{y} + \frac{4}{x} = 5 \tag{4}$$

Let

$$\frac{1}{x} = a, \frac{1}{y} = b \tag{5}$$

So, new equations

$$3a + 6b = 6 \tag{6}$$

$$4a + 2b = 5 \tag{7}$$

$$\begin{pmatrix} 3 & 6 \\ 4 & 2 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} \begin{pmatrix} 6 \\ 5 \end{pmatrix} \tag{8}$$

$$\mathbf{A}\mathbf{x} = \mathbf{c} \tag{9}$$

Gaussian elimination on A

$$\begin{pmatrix}
3 & 6 & | & 6 \\
4 & 2 & | & 5
\end{pmatrix} \xrightarrow{R_2 - \frac{4R_1}{3}} \begin{pmatrix}
3 & 6 & | & 6 \\
0 & -6 & | & -3
\end{pmatrix}$$
(10)

$$\xrightarrow{\frac{R_2}{-6}} \begin{pmatrix} 3 & 6 & 6 \\ 0 & 1 & \frac{1}{2} \end{pmatrix} \tag{11}$$

Therefore, by putting values in (8)

For x,y

$$\begin{pmatrix} \frac{1}{x} \\ \frac{1}{y} \end{pmatrix} = \begin{pmatrix} 1 \\ \frac{1}{2} \end{pmatrix} \tag{13}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$
 (14)

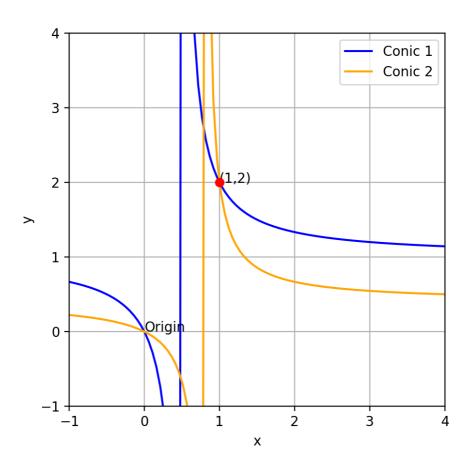


Fig. 1