# Matrices in Geometry 5.2.38

EE25BTECH11035 - Kushal B N

**Question:**
Solve the following system of equations.

$$\frac{1}{2x} + \frac{1}{3y} = 2$$
$$\frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$$

**Solution:**
Let

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

So that the given equations, after multiplying by 6 on both sides, can be represented in the matrix form as

$$\begin{pmatrix} 3 & 2 \\ 2 & 3 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 12 \\ 13 \end{pmatrix} \tag{2}$$

Which can be represented as the augmented matrix

$$\left(\begin{array}{cc|c} 3 & 2 & 12 \\ 2 & 3 & 13 \end{array}\right) \tag{3}$$

$$\left(\begin{array}{cc|c} 3 & 2 & 12 \\ 2 & 3 & 13 \end{array}\right) \xleftrightarrow{R_2 \leftarrow R_2 - \frac{2}{3}R_1 0} \left(\begin{array}{cc|c} 3 & 2 & 12 \\ 0 & \frac{5}{3} & 5 \end{array}\right) \tag{4}$$

$$\xleftrightarrow{R_1 \leftarrow R_1 - \frac{6}{5}R_2} \left(\begin{array}{cc|c} 3 & 0 & 6 \\ 0 & \frac{5}{3} & 5 \end{array}\right) \tag{5}$$

So, by this, we get

$$\frac{1}{y} = 3 \implies y = \frac{1}{3} \tag{6}$$

$$\frac{1}{x} = 2 \implies x = \frac{1}{2} \tag{7}$$

**Final Answer:**
The solution for the given system of linear equations is $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

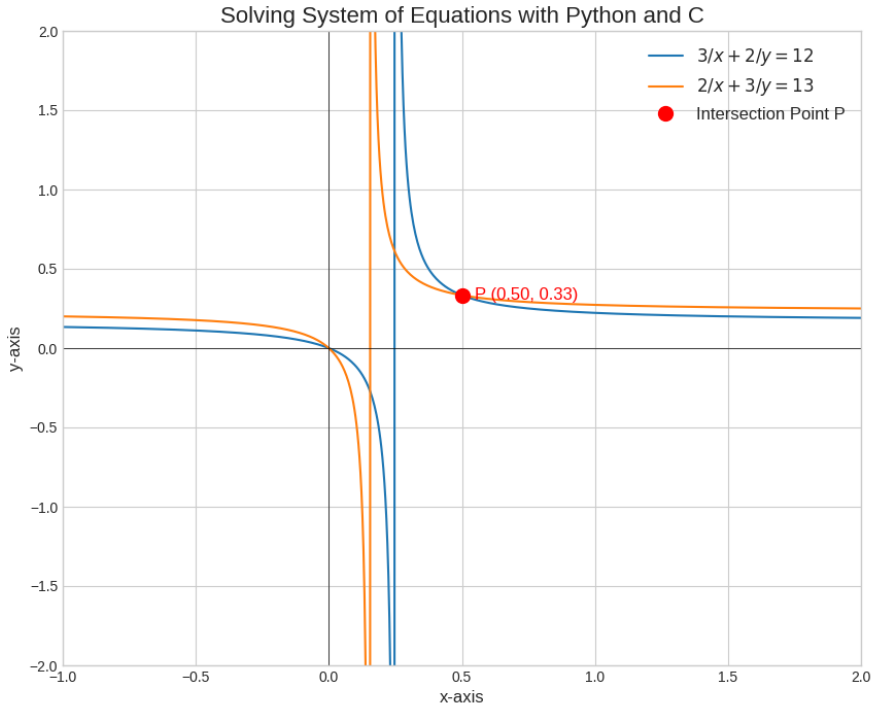
Solving System of Equations with Python and C
3/x + 2/y = 12
2/x + 3/y = 13
Intersection Point P
P (0.50, 0.33)
y-axis
x-axis
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0

Fig. 1