5.2.23

EE25BTECH11020 - Darsh Pankaj Gajare

Question:
Solve the following system of linear equations

$$\frac{3x}{2} - \frac{5y}{2} = -2, \frac{x}{3} + \frac{y}{2} = \frac{13}{6} \tag{1}$$

Solution:

TABLE I

$\mathbf{n_1}$	$\begin{pmatrix} \frac{3}{2} \\ \frac{-5}{2} \end{pmatrix}$
$\mathbf{n_2}$	$\begin{pmatrix} \frac{1}{3} \\ \frac{1}{2} \end{pmatrix}$

Let the point of intersection be $\mathbf{P}$

$$\mathbf{n_1}^\top \mathbf{P} = -2 \tag{2}$$

$$\mathbf{n_2}^\top \mathbf{P} = \frac{13}{6} \tag{3}$$

$$\begin{pmatrix} \mathbf{n_1}^\top \\ \mathbf{n_2}^\top \end{pmatrix} \mathbf{P} = \begin{pmatrix} -2 \\ \frac{13}{6} \end{pmatrix} \tag{4}$$

$$\left(\begin{array}{cc|c} \frac{3}{2} & \frac{-5}{2} & -2 \\ \frac{1}{3} & \frac{1}{2} & \frac{13}{6} \end{array}\right) \tag{5}$$

$R_1 = 2R_1$, $R_2 = 6R_2$

$$\left(\begin{array}{cc|c} 3 & -5 & -4 \\ 2 & 3 & 13 \end{array}\right) \tag{6}$$

$R_2 = R_2 - \frac{2}{3}R_1$

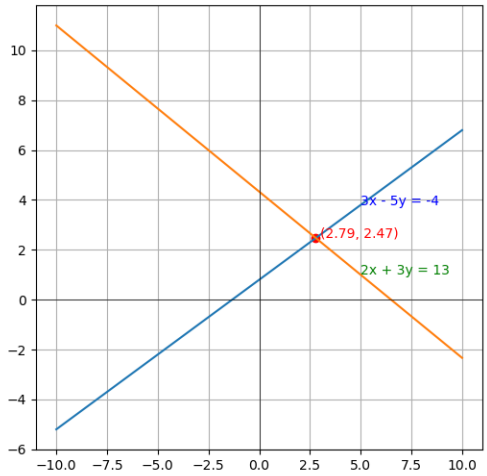
$$\left(\begin{array}{cc|c} 3 & -5 & -4 \\ 0 & \frac{19}{3} & \frac{47}{3} \end{array}\right) \tag{7}$$

$$\frac{19}{3}y = \frac{47}{3} \implies y = \frac{47}{19} \tag{8}$$

$$3x - 5 \cdot \frac{47}{19} = -4 \implies x = \frac{53}{19} \tag{9}$$

$$\mathbf{P} = \begin{pmatrix} \frac{53}{19} \\ \frac{47}{19} \end{pmatrix} \tag{10}$$

Plot using C libraries:



Plot using Python: