5.2.23

EE25BTECH11020 - Darsh Pankaj Gajare

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Question:
Solve the following system of linear equations

$$\frac{3x}{2} - \frac{5y}{2} = -2, \frac{x}{3} + \frac{y}{2} = \frac{13}{6} \tag{0.1}$$

Solution:

Table

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

Let the point of intersection be **P**

$$\mathbf{n_1}^\top \mathbf{P} = -2 \tag{0.2}$$

$$\mathbf{n_2}^\top \mathbf{P} = \frac{13}{6} \tag{0.3}$$

$$\begin{pmatrix} \mathbf{n_1}^\top \\ \mathbf{n_2}^\top \end{pmatrix} \mathbf{P} = \begin{pmatrix} -2 \\ \frac{13}{6} \end{pmatrix} \tag{0.4}$$

$$\left(\begin{matrix} \frac{3}{2} & \frac{-5}{2} \\ \frac{1}{3} & \frac{1}{2} \end{matrix} \;\middle|\; \begin{matrix} -2 \\ \frac{13}{6} \end{matrix} \right) \tag{0.5}$$

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

$$\left(\begin{matrix} 3 & -5 \\ 2 & 3 \end{matrix} \;\middle|\; \begin{matrix} -4 \\ 13 \end{matrix} \right) \tag{0.6}$$

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

$$\left(\begin{matrix} 3 & -5 \\ 0 & \frac{19}{3} \end{matrix} \;\middle|\; \begin{matrix} -4 \\ \frac{47}{3} \end{matrix} \right) \tag{0.7}$$
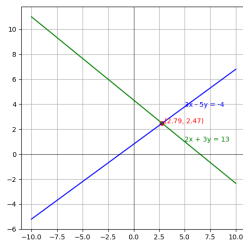
$$\frac{19}{3}y = \frac{47}{3} \implies y = \frac{47}{19} \tag{0.8}$$

$$3x - 5 \cdot \frac{47}{19} = -4 \implies x = \frac{53}{19} \tag{0.9}$$

$$\mathbf{P} = \begin{pmatrix} \frac{53}{19} \\ \frac{47}{19} \end{pmatrix} \tag{0.10}$$
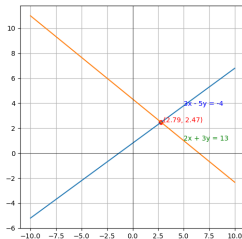
Plot using C libraries

Plot using Python