5.2.66

EE25BTECH11064 - Yojit Manral

Question:

Solve the system of equations

$$2x + 3y = 11 \tag{1}$$
$$2x + 4y = -24 \tag{2}$$

Hence, find the value of m for which

$$y = mx + 3 \tag{3}$$

Solution:

→ We have

$$\mathbf{n_1}^T\mathbf{x} = c_1 \qquad\qquad \mathbf{n_2}^T\mathbf{x} = c_2$$

$$\implies \begin{pmatrix}\mathbf{n_1}^T\\ \mathbf{n_2}^T\end{pmatrix}\mathbf{x} = \begin{pmatrix}c_1\\ c_2\end{pmatrix} \tag{4}$$

→ From (1) and (2)

$$\mathbf{n_1} = \begin{pmatrix}2\\3\end{pmatrix} \qquad c_1 = 11 \tag{5}$$
$$\mathbf{n_2} = \begin{pmatrix}2\\4\end{pmatrix} \qquad c_2 = -24 \tag{6}$$

→ From (4), (5) and (6)

$$\begin{pmatrix}2 & 3\\ 2 & 4\end{pmatrix}\mathbf{x} = \begin{pmatrix}11\\-24\end{pmatrix} \xrightarrow{R_2 \leftrightarrow R_2 - R_1} \begin{pmatrix}2 & 3\\ 0 & 1\end{pmatrix}\mathbf{x} = \begin{pmatrix}11\\-35\end{pmatrix} \tag{7}$$
$$\xrightarrow{R_1 \leftrightarrow R_1 - 3R_2} \begin{pmatrix}2 & 0\\ 0 & 1\end{pmatrix}\mathbf{x} = \begin{pmatrix}116\\-35\end{pmatrix} \tag{8}$$
$$\xrightarrow{R_1 \leftrightarrow (1/2)R_1} \begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\mathbf{x} = \begin{pmatrix}58\\-35\end{pmatrix} \tag{9}$$
$$\implies \begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}58\\-35\end{pmatrix} \implies x = 58 \text{ and } y = -35 \tag{10}$$

→ From (3)

$$m = \frac{y-3}{x} = -\frac{19}{29} \tag{11}$$

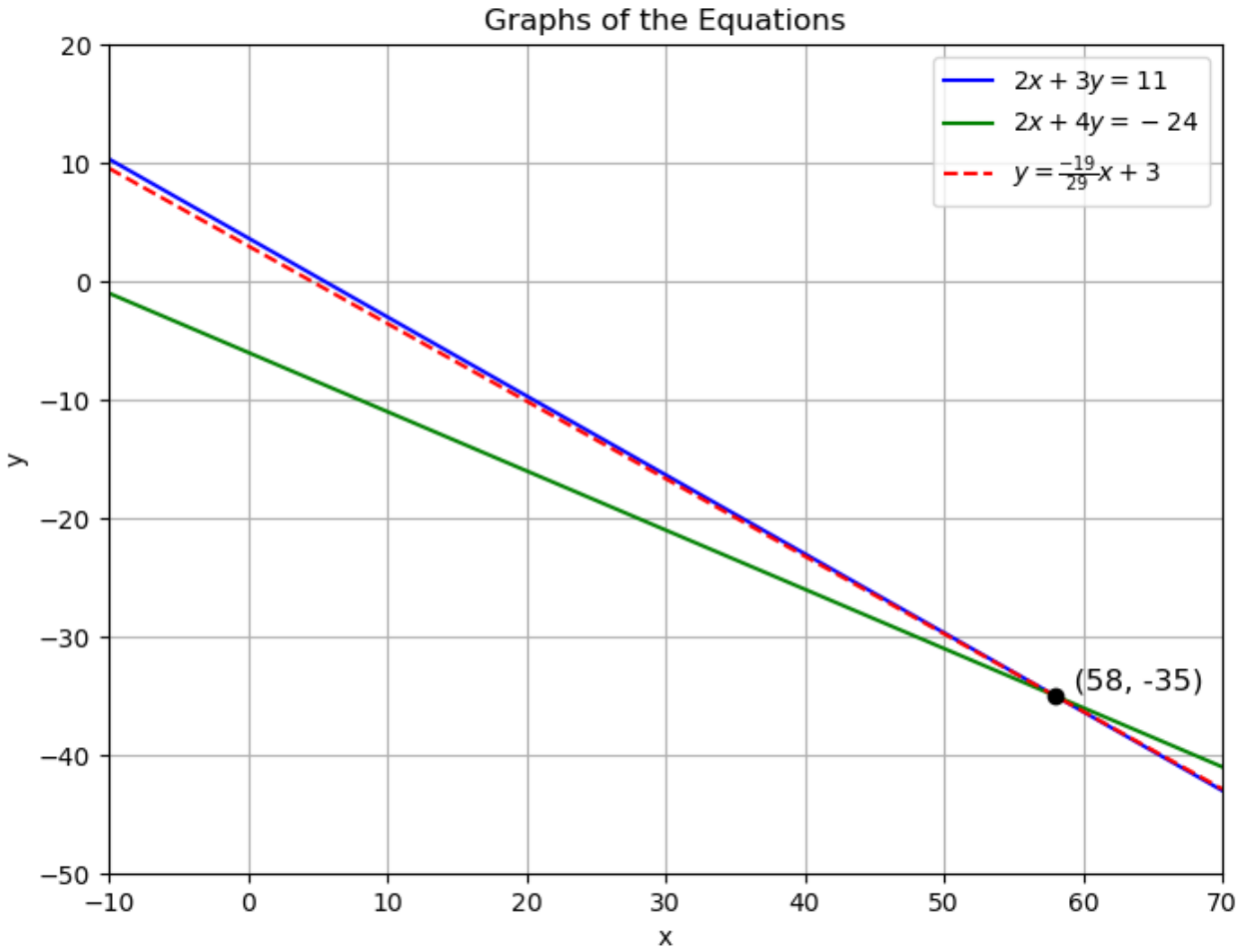

Fig. 0: Plot of the Equations