4.7.59

EE25BTECH11062 - Vivek K Kumar

Question:
Find the equation of a line perpendicular to the line $x + 2y + 3 = 0$ and passing through the point $(1, -2)$.

Solution:

Point	Value
$\mathbf{n_1}$	$\begin{pmatrix}1\\2\end{pmatrix}$
$\mathbf{n_2}$	$\begin{pmatrix}1\\k\end{pmatrix}$
$\mathbf{c}$	-3
$\mathbf{A}$	$\begin{pmatrix}1\\-2\end{pmatrix}$

TABLE 0: Variables used

The given line can be expressed as

$$\mathbf{n_1}^\top \mathbf{x} = c \tag{0.1}$$

$$\begin{pmatrix}1 & 2\end{pmatrix}\mathbf{x} = -3 \tag{0.2}$$

$$\tag{0.3}$$

As the given lines are perpendicular

$$\mathbf{n_1}^\top \mathbf{n_2} = 0 \tag{0.4}$$

$$k = \frac{-1}{2} \tag{0.5}$$

$$\mathbf{n_2} = \begin{pmatrix}1\\-1/2\end{pmatrix} \tag{0.6}$$

The equation of the resulting line can be expressed as

$$\mathbf{n_2}^\top (\mathbf{x} - \mathbf{A}) = 0 \tag{0.7}$$

$$\begin{pmatrix}1 & \frac{-1}{2}\end{pmatrix}\mathbf{x} = \begin{pmatrix}1 & \frac{-1}{2}\end{pmatrix}\begin{pmatrix}1\\-2\end{pmatrix} \tag{0.8}$$

$$\begin{pmatrix}1 & \frac{-1}{2}\end{pmatrix}\mathbf{x} = 2 \tag{0.9}$$

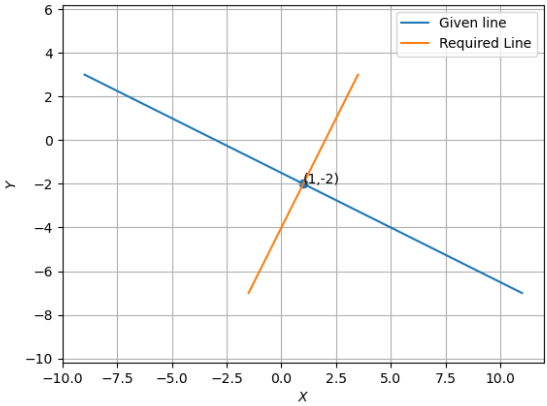

Fig. 0.1: Given points on a line