Assignment 1: Matrix Theory

Alok ranjan
Roll No.: EE20MTECH11013
Assignment1

***Abstract*—This assignment solves a problem to find the slope of a line.**

Download all python codes from

https://github.com/Alok0895/Assignment1/blob/master/Assignment1.py

and latex-tikz codes from

https://github.com/Alok0895/Assignment1/blob/master/Assignment1.tex

1 Problem

The perpendicular from the origin to the line $\begin{pmatrix}-m & 1\end{pmatrix}\mathbf{x} = c$ meets it at the point $\mathbf{P} = \begin{pmatrix}-1\\2\end{pmatrix}$. find the value of m and c .

2 Solution

According to the questio,the given line can be expressed as:-

$$L_1 \implies \begin{pmatrix}-m & 1\end{pmatrix}\mathbf{x} = c$$

Direction vector of line L_2 perpendicular to L_1 should be $\begin{pmatrix}1\\m\end{pmatrix}$ such that the equation of line should be:-

$$L_2 \implies \begin{pmatrix}1\\m\end{pmatrix}^T(\mathbf{x} - \begin{pmatrix}-1\\2\end{pmatrix}) = 0$$

Therefore L_2 can be expressed as:-

$$\implies \begin{pmatrix}1 & m\end{pmatrix}(\mathbf{x} - \begin{pmatrix}-1\\2\end{pmatrix}) = 0$$

$$\begin{pmatrix}m & 1\end{pmatrix}\begin{pmatrix}0\\0\end{pmatrix} - \begin{pmatrix}1 & m\end{pmatrix}\begin{pmatrix}-1\\2\end{pmatrix} = 0 \tag{2.0.1}$$

$$\implies (-1 + 2m) = 0 \tag{2.0.2}$$

$$\implies m = \frac{1}{2} \tag{2.0.3}$$

$$\implies m = 0.5 \tag{2.0.4}$$

putting the value of m in line L_1

$$\begin{pmatrix}-0.5 & 1\end{pmatrix}\begin{pmatrix}x\end{pmatrix} = c \tag{2.0.5}$$

$$\implies \begin{pmatrix}-0.5 & 1\end{pmatrix}\begin{pmatrix}-1\\2\end{pmatrix} = c$$

$$\implies c = 2.5 \tag{2.0.6}$$

Hence, the value of m and c are obtained as 0.5 and 2.5 respectively.

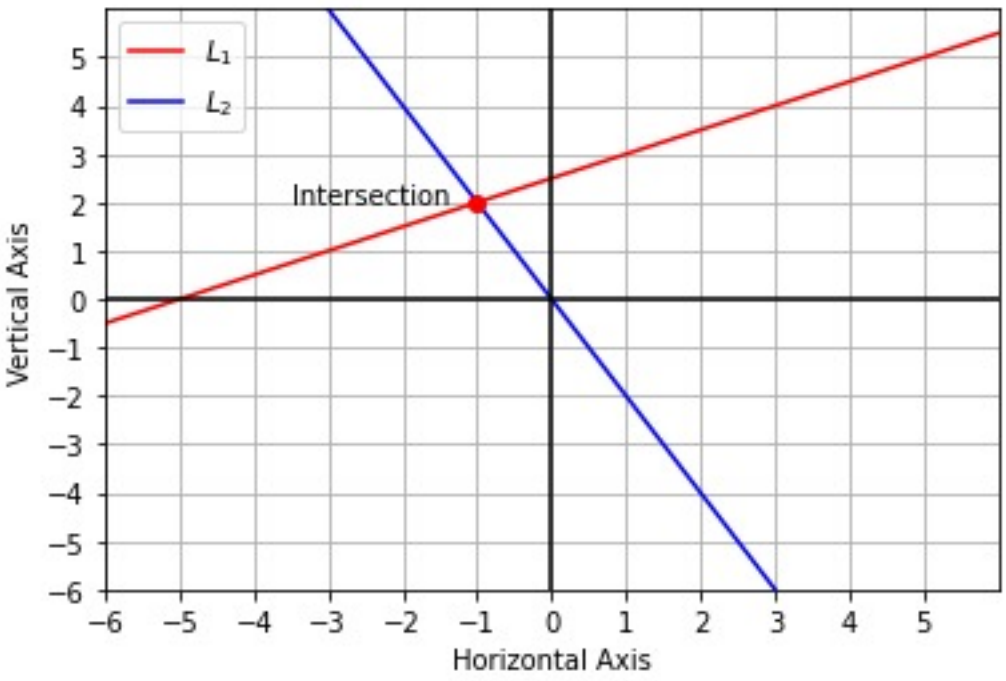

Fig. 0: Perpendicular Lines crossing