MATRIX THEORY

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1 Question 43, P.59

The perpendicular from the origin to the line
(-m 1)x=c
meets it at the point (-1 2). Find the values of m and c.

1.1 Python Code & Latex Code Links

1.Python Code:- https://github.com/Alok0895/Assignment1/blob/master/Assignment1.py
2.Latex Code:- https://github.com/Alok0895/Assignment1/blob/master/Assignment1.tex

1.2 Explanation

The line through the origin perpendicular to the given line is in the form of:-
$L_1 \implies (-m\ 1)x = c$
Direction vector of line L_2 perpendicular to L_1 should be $\binom{1}{m}$ such that the equation of line should be
$L_2 \implies \binom{1}{m}^T \left(x - \binom{-1}{2}\right) = 0$
Therefore L_2 is,

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

Since it passes through (0,0) therefore:-

$$(1\ m)\begin{pmatrix}0\\0\end{pmatrix} - (1\ m)\begin{pmatrix}-1\\2\end{pmatrix} = 0 \tag{2}$$

$$\implies (-1+2m) = 0$$

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

$$\implies m = 0.5 \tag{3}$$

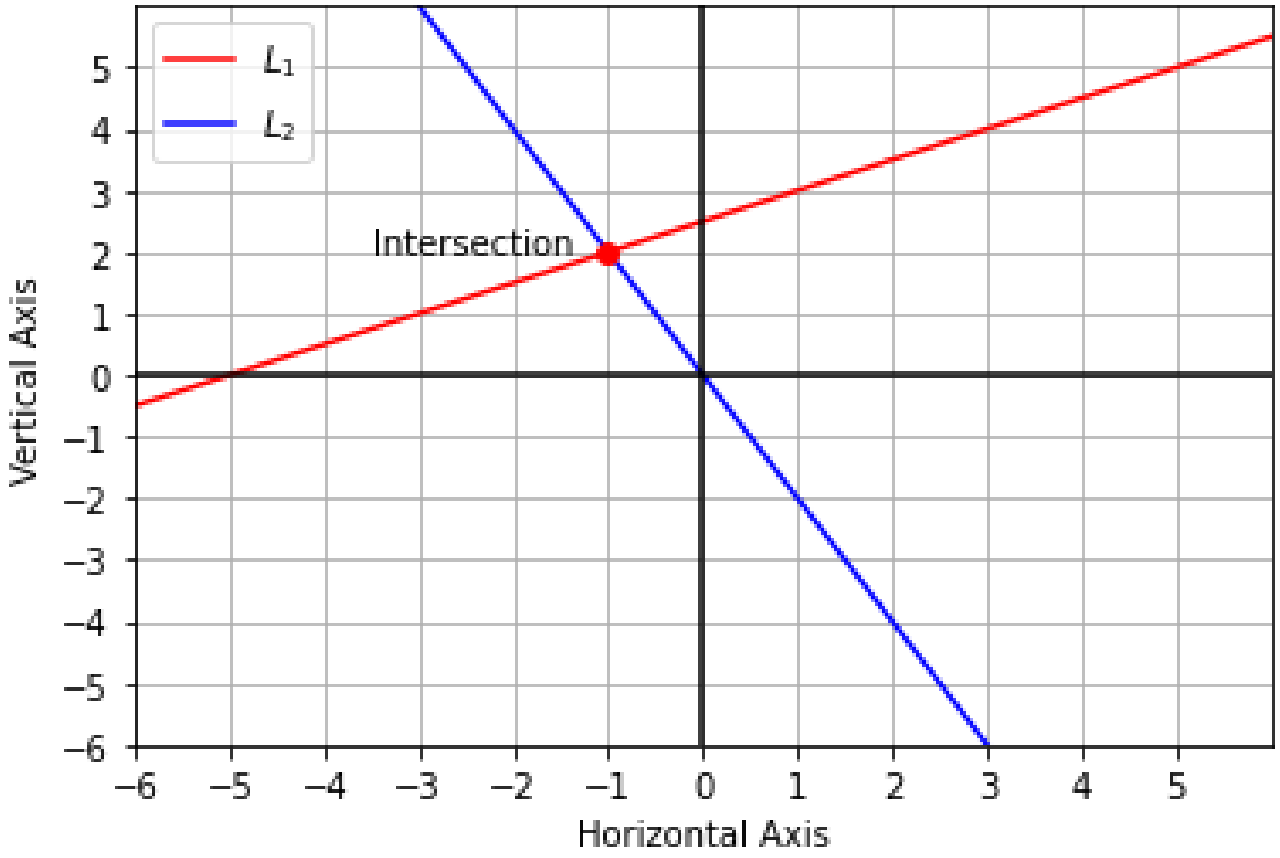

Figure 1: Lines perpendicular at (-1,2)

Now from equation(3) and the knowledge that $(-1, 2)$ lies on L, we put value of m in line L_1 such that:-

$$(-0.5\ \ 1)x = c \tag{4}$$

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

$$\implies c = 2.5 \tag{5}$$

Hence, the value of m and c is obtained from (2) and (3) as 0.5 and 2.5 respectively.