Assignment 1: Matrix Theory

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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

The line

$$\begin{pmatrix} -m & 1 \end{pmatrix} \mathbf{x} = c \tag{2.0.1}$$

meets it at the point $\mathbf{P} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$
Since,

$$\mathbf{P} - \mathbf{0} = \mathbf{P} \tag{2.0.2}$$

is the normal vector, where $\mathbf{0}$ is the origin, then

$$\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix} \tag{2.0.3}$$

is the direction vector, Hence

$$\mathbf{m}^T \mathbf{P} = 0 \tag{2.0.4}$$

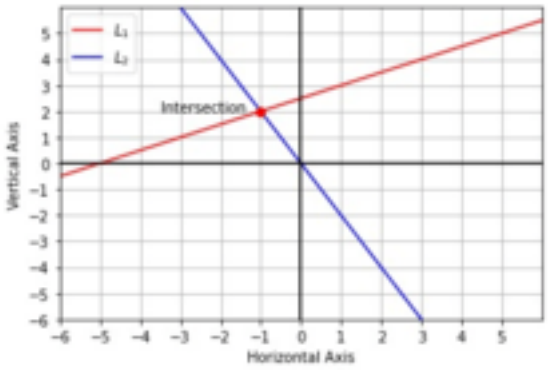

Fig. 0: Perpendicular Lines crossing

$$\implies \begin{pmatrix} 1 & m \end{pmatrix} \begin{pmatrix} -1 \\ 2 \end{pmatrix} = 0$$
$$\implies (-1 + 2m) = 0$$
$$\implies m = \frac{1}{2}$$
$$\implies m = 0.5 \tag{2.0.5}$$

now the line

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

meets it at the point $\mathbf{P}=\begin{pmatrix} -1 \\ 2 \end{pmatrix}$and using the value of m from 2.0.5 we get,

$$\begin{pmatrix} -0.5 & 1 \end{pmatrix} \mathbf{P} = c$$
$$\implies \begin{pmatrix} -0.5 & 1 \end{pmatrix} \begin{pmatrix} -1 \\ 2 \end{pmatrix} = c$$
$$\implies c = 2.5$$

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