Matrix Theory: Assignment 1

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

1 Problem Statement

Find the slope of a line, which passes through the origin, and the mid-point of the line segment joining the points $\vec{P} = \begin{pmatrix} 0 \\ -4 \end{pmatrix}$ and $\vec{B} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$.

2 Solution

We are given two points $\vec{P}$ and $\vec{B}$. Let their mid-point be denoted by $\vec{Q}$.

$$\therefore \vec{Q} = \frac{\vec{P} + \vec{B}}{2} = \frac{1}{2}\left\{ \begin{pmatrix} 0 \\ -4 \end{pmatrix} + \begin{pmatrix} 8 \\ 0 \end{pmatrix} \right\}$$
$$= \begin{pmatrix} 4 \\ -2 \end{pmatrix}$$

We know, $\vec{O}$= Origin= (0,0)
Now, using(2), slope of the line passing through the origin and Q is

$$m = \frac{-2-0}{4-0} = -\frac{1}{2}$$

Now, the directional vector is

$$\vec{OQ} = \begin{pmatrix} 4 \\ -2 \end{pmatrix} - \begin{pmatrix} 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 4 \\ -2 \end{pmatrix} \tag{1}$$

Vector equation of the line is:

$$\vec{r} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 4 \\ -2 \end{pmatrix} \tag{2}$$

i.e,

$$\vec{r} = \lambda \begin{pmatrix} 4 \\ -2 \end{pmatrix} \tag{3}$$