ASSIGNMENT 1

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***Abstract*—This document illustrates the ratio in which a line divides another line joining two points**

Download all python codes from

https://github.com/EE20MTECH14019/EE5609/tree/master/Assignment_1/Codes

and latex-tikz codes from

https://github.com/EE20MTECH14019/EE5609/tree/master/Assignment_1

1 Problem

In what ratio is the line joining $\begin{pmatrix}-1\\1\end{pmatrix}$ and $\begin{pmatrix}5\\7\end{pmatrix}$ is divided by the line

$$\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{x} = 4 \tag{1.0.1}$$

2 Explanation

The point X divides the line segment joining the two points A=$\begin{pmatrix}-1\\1\end{pmatrix}$ and B=$\begin{pmatrix}5\\7\end{pmatrix}$ in ratio k : 1. Then,

$$\mathbf{X} = \frac{(k\mathbf{B} + \mathbf{A})}{(k+1)} \tag{2.0.1}$$

3 solution

From the equation (2.0.1)

$$(k+1)\mathbf{X} = k\mathbf{B} + \mathbf{A} \tag{3.0.1}$$

Let n=$\begin{pmatrix}1\\1\end{pmatrix}$

$$\implies (k+1)\,\mathbf{n}^T\mathbf{X} = \mathbf{n}^T\,(k\mathbf{B} + \mathbf{A}) \tag{3.0.2}$$

$$\implies k\left(\mathbf{n}^T\mathbf{X} - \mathbf{n}^T\mathbf{B}\right) = \mathbf{n}^T\mathbf{A} - \mathbf{n}^T\mathbf{X} \tag{3.0.3}$$

$$\implies k = \frac{\mathbf{n}^T\mathbf{A} - \mathbf{n}^T\mathbf{X}}{\mathbf{n}^T\mathbf{X} - \mathbf{n}^T\mathbf{B}} \tag{3.0.4}$$

Hence on solving the equation (3.0.4) using

$$\mathbf{n}^T\mathbf{X} = 4 \tag{3.0.5}$$

The line $\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{x}$=4 divides the line joining points $\mathbf{A}$=$\begin{pmatrix}-1\\1\end{pmatrix}$ and $\mathbf{B}$=$\begin{pmatrix}5\\7\end{pmatrix}$ in the ratio k=1/2

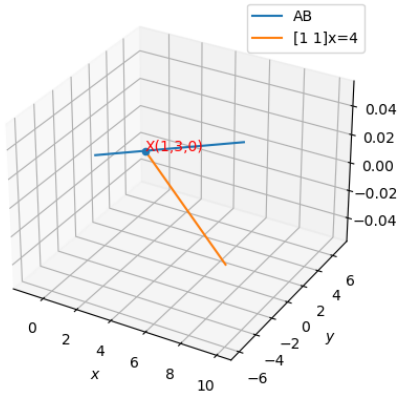

Fig. 0: Line as (1 1)$\mathbf{x}$=4 intersecting the line joining points A and B