# ASSIGNMENT 1

YENIGALLA SAMYUKTHA
EE20MTECH14019

***Abstract*—This document illustrates the ratio in which 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 $\begin{pmatrix}5\\7\end{pmatrix}$ divided by the line

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

## 2 Construction

### 2.1 Intersecting Point

The intersecting point of two line segments can be found by row reducing the augmented matrix formed using two line segments. Let's say the intersecting point is $\mathbf{X}$

### 2.2 Ratio

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

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

## 3 solution

We have the two line equations

$$\begin{pmatrix}-1 & 1\end{pmatrix}\mathbf{X} = 2 \tag{3.0.1}$$

$$\begin{pmatrix}1 & 1\end{pmatrix}\mathbf{X} = 4 \tag{3.0.2}$$

The augmented matrix for the above equations is row reduced as follows

$$\begin{pmatrix}-1 & 1 & 2\\1 & 1 & 4\end{pmatrix} \xleftrightarrow{R_1 \leftarrow R_2 - R_1} \begin{pmatrix}2 & 0 & 2\\1 & 1 & 4\end{pmatrix} \tag{3.0.3}$$

$$\xleftrightarrow{R_1 \leftarrow R_1/2} \begin{pmatrix}1 & 0 & 1\\1 & 1 & 4\end{pmatrix} \tag{3.0.4}$$

$$\xleftrightarrow{R_2 \leftarrow R_2 - R_1} \begin{pmatrix}1 & 0 & 1\\0 & 1 & 3\end{pmatrix} \tag{3.0.5}$$

$$\mathbf{P} = \begin{pmatrix}1 & 3\end{pmatrix} \tag{3.0.6}$$

Substituting the point P in equation

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

$$\begin{pmatrix}1\\3\end{pmatrix} = \frac{k\begin{pmatrix}5\\7\end{pmatrix} + \begin{pmatrix}-1\\1\end{pmatrix}}{k+1} \tag{3.0.7}$$

On solving the above equation, we obtain ratio as 1:2

## 4 figure