EE3900 Assignment - 1

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Download latex-tikz codes from

https://github.com/adhvik24/EE3900/blob/main/Assignment_1/Assignment_1.tex

Download python codes from

https://github.com/adhvik24/EE3900/blob/main/Assignment_1/Assignment1.py

1 Ramsey 1.1 qn 14

Prove that the middle point of the line joining the points $\begin{pmatrix}-5\\12\end{pmatrix}$ and $\begin{pmatrix}9\\-2\end{pmatrix}$ is a point of trisection of the line joining the points $\begin{pmatrix}-8\\-5\end{pmatrix}$ and $\begin{pmatrix}7\\10\end{pmatrix}$.

2 SOLUTION

The $\mathbf{C}$ that divides $\mathbf{A},\mathbf{B}$ in the ratio $k:1$ is

$$\mathbf{C} = \frac{k\mathbf{B}+\mathbf{A}}{k+1} \tag{2.0.1}$$

Let $\mathbf{C}$ is the middle point of the line joining the points $\mathbf{A} = \begin{pmatrix}-5\\12\end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix}9\\-2\end{pmatrix}$, Then $k = 1$,

$$\mathbf{C} = \frac{\mathbf{B}+\mathbf{A}}{1+1} = \frac{\mathbf{B}+\mathbf{A}}{2} \tag{2.0.2}$$

$$= \frac{\begin{pmatrix}9\\-2\end{pmatrix}+\begin{pmatrix}-5\\12\end{pmatrix}}{2} \tag{2.0.3}$$

$$\implies \mathbf{C} = \begin{pmatrix}2\\5\end{pmatrix} \tag{2.0.4}$$

And now we have to find the ratio in which $\mathbf{C}$ divides the line joining the points $\mathbf{P} = \begin{pmatrix}-8\\-5\end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix}7\\10\end{pmatrix}$. Let the ratio is $k:1$, Then,

$$\implies \mathbf{C} = \frac{k\mathbf{Q}+\mathbf{P}}{k+1} \tag{2.0.5}$$

$$\begin{pmatrix}2\\5\end{pmatrix} = \frac{k\begin{pmatrix}7\\10\end{pmatrix}+\begin{pmatrix}-8\\-5\end{pmatrix}}{k+1} \tag{2.0.6}$$

$$\begin{pmatrix}2\\5\end{pmatrix} = \frac{1}{k+1}\begin{pmatrix}7k-8\\10k-5\end{pmatrix} \tag{2.0.7}$$

$$\implies k = 2 \tag{2.0.8}$$

As $k = 2$, That implies $\mathbf{C}$ divides the line joining the points $\mathbf{P} = \begin{pmatrix}-8\\-5\end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix}7\\10\end{pmatrix}$ in the ratio $2:1$.
$\therefore$ $\mathbf{C}$ is point of trisection of line joining $\mathbf{P}$ and $\mathbf{Q}$.

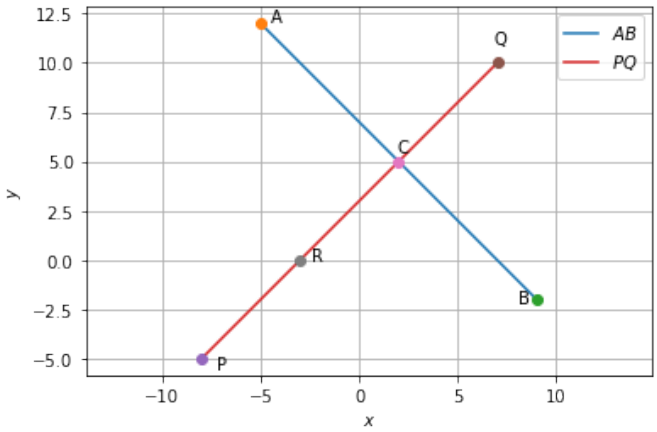

Fig. 1: graphical representation of points and lines

$\therefore$ The middle point of the line joining the points $\begin{pmatrix}-5\\12\end{pmatrix}$ and $\begin{pmatrix}9\\-2\end{pmatrix}$ is a point of trisection of the line joining the points $\begin{pmatrix}-8\\-5\end{pmatrix}$ and $\begin{pmatrix}7\\10\end{pmatrix}$.