Math Document Template

C ANISH

***Abstract*—This is a document explaining a question about the concept of sectioning a line segment.**

Download all python codes from

```
svn co https://github.com/chakki1234/summer
    -2020/trunk/linearalg/codes
```

and latex-tikz codes from

```
svn co https://github.com/chakki1234/summer
    -2020/trunk/linearalg/figs
```

1 Problem

Find the coordinates of the points of trisection of the line segment joining $\begin{pmatrix}4\\-1\end{pmatrix}$ and $\begin{pmatrix}-2\\-3\end{pmatrix}$.

2 Construction

2.1.

$$\mathbf{A} = \begin{pmatrix}0\\0\end{pmatrix} \tag{2.1.1}$$

$$\mathbf{B} = \begin{pmatrix}a\\0\end{pmatrix} \tag{2.1.2}$$

2.2. To find the coordinates of **C** and **D**.
Solution: Let **E** be a point which divides line segment AB in the ratio $k:1$:

$$\mathbf{E} = \frac{k\mathbf{A}+\mathbf{B}}{k+1} \tag{2.2.1}$$

C divides the line in the ratio $\frac{1}{2}:1$ and **D** divides the line in the raio $\frac{2}{1}:1$

$$\mathbf{C} = \frac{0.5\mathbf{A}+\mathbf{B}}{0.5+1} \tag{2.2.2}$$

$$\mathbf{D} = \frac{2\mathbf{A}+\mathbf{B}}{2+1} \tag{2.2.3}$$

$$\therefore \mathbf{C} = \begin{pmatrix}0\\-2.33\end{pmatrix} \tag{2.2.4}$$

$$\therefore \mathbf{D} = \begin{pmatrix}2\\-1.66\end{pmatrix} \tag{2.2.5}$$

Output values	
Parameter	Value
C	$\begin{pmatrix}0\\-2.33\end{pmatrix}$
D	$\begin{pmatrix}2\\-1.66\end{pmatrix}$

TABLE 2.3: Values of **C** and **D**

2.3. From the given information, The values are listed in 2.3

2.4. Draw Fig. 2.4.

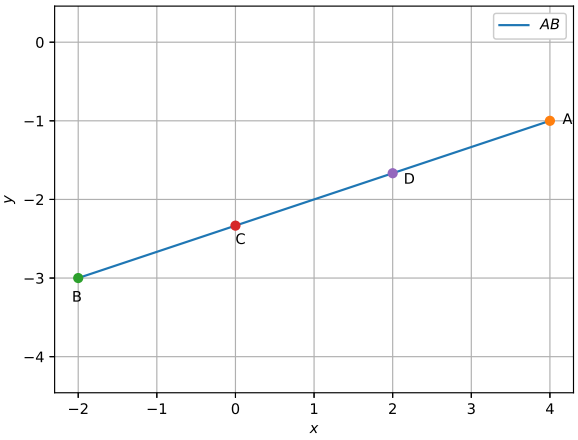

Fig. 2.4: Triangle generated using python

Solution: The following Python code generates Fig. 2.4

```
codes/trisection.py
```

3 Solution

Let **E** be a point which divides line segment AB in the ratio $k:1$:

$$\mathbf{E} = \frac{k\mathbf{A}+\mathbf{B}}{k+1} \tag{4.1}$$

C divides the line in the ratio $\frac{1}{2} : 1$ and **D** divides the line in the raio $\frac{2}{1} : 1$

$$\mathbf{C} = \frac{0.5\mathbf{A} + \mathbf{B}}{0.5 + 1} \tag{4.2}$$

$$\mathbf{D} = \frac{2\mathbf{A} + \mathbf{B}}{2 + 1} \tag{4.3}$$

$$\therefore \mathbf{C} = \begin{pmatrix} 0 \\ -2.33 \end{pmatrix} \tag{4.4}$$

$$\therefore \mathbf{D} = \begin{pmatrix} 2 \\ -1.66 \end{pmatrix} \tag{4.5}$$