

Assignment 1

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vector

Abstract—This document contains the solution to find the coordinates of the points of section, given the line joining points is divided into four equal parts.

Download all python codes from

<https://github.com/NamrataMishra97/Assignment-1-EE5600>

and latex codes from

<https://www.overleaf.com/project/613635b77e317673c499deca>

Problem

Vector-2, Example-1, Question-20

The line joining the points $\begin{pmatrix} -6 \\ 8 \end{pmatrix}$ and $\begin{pmatrix} 8 \\ -6 \end{pmatrix}$ is divided into four equal parts; Find the coordinates of the points of section.

Solution:

Let us consider the coordinate of points **D,E,F** which divides the line segment **A** and **B** into four equal parts.

In the ratio of **m:n** is given by the section formula:

$$\mathbf{S} = \frac{m\mathbf{B} + n\mathbf{A}}{m + n} \quad (0.0.1)$$

The coordinate of point **D** which divide the line joining **A** and **B** in the ratio of **1:3** is given that,

$$\mathbf{A} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 8 \\ -6 \end{pmatrix} \quad (0.0.2)$$

$$\mathbf{D} = \frac{1\mathbf{B} + 3\mathbf{A}}{4} \quad (0.0.3)$$

$$= \frac{1 \begin{pmatrix} 8 \\ -6 \end{pmatrix} + 3 \begin{pmatrix} -6 \\ 8 \end{pmatrix}}{4} \quad (0.0.4)$$

$$= \frac{1}{2} \begin{pmatrix} -5 \\ 9 \end{pmatrix} \quad (0.0.5)$$

The coordinate of point **E** which divide the line joining **A** and **B** in the ratio of **1:1** is given that,

$$\mathbf{E} = \frac{1\mathbf{B} + 1\mathbf{A}}{2} \quad (0.0.6)$$

$$= \frac{1 \begin{pmatrix} 8 \\ -6 \end{pmatrix} + 1 \begin{pmatrix} -6 \\ 8 \end{pmatrix}}{2} \quad (0.0.7)$$

$$= \frac{1}{2} \begin{pmatrix} 2 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (0.0.8)$$

The coordinate of point **F** which divide the line joining **A** and **B** in the ratio of **3:1** is given that,

$$\mathbf{F} = \frac{3\mathbf{B} + 1\mathbf{A}}{4} \quad (0.0.9)$$

$$= \frac{3 \begin{pmatrix} 8 \\ -6 \end{pmatrix} + 1 \begin{pmatrix} -6 \\ 8 \end{pmatrix}}{4} \quad (0.0.10)$$

$$= \frac{1}{2} \begin{pmatrix} 9 \\ -5 \end{pmatrix} \quad (0.0.11)$$

Result

Plot of coordinate of the points obtained from Python code is shown below.

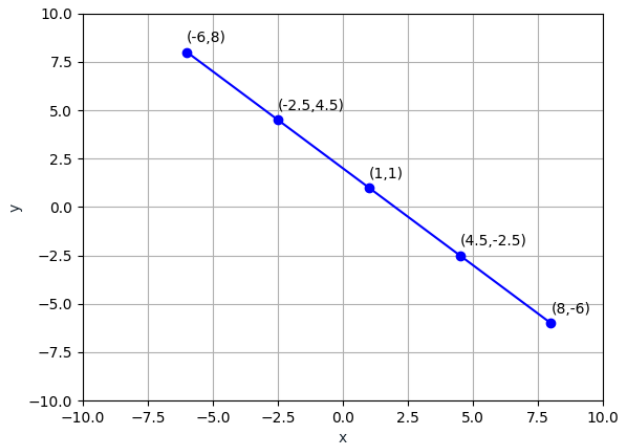


Fig. 0: Plot of coordinate of the point which divides the line into four parts

Conclusion

The points **D, E, F** divides the lines into four equal parts in the ratio of **(1:3), (1:1), (3:1)**.

The points we get $\mathbf{D} = \frac{1}{2} \begin{pmatrix} -5 \\ 9 \end{pmatrix}$, $\mathbf{E} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$, $\mathbf{F} = \frac{1}{2} \begin{pmatrix} 9 \\ -5 \end{pmatrix}$