Assignment 1

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vector

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

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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** in given by the section formula:

$$\mathbf{S} = \frac{m\mathbf{B} + n\mathbf{A}}{m + n} \tag{0.0.1}$$

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

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

$$\mathbf{D} = \frac{1\mathbf{B} + 3\mathbf{A}}{4} \tag{0.0.3}$$

$$\mathbf{D} = \frac{1\begin{pmatrix} 8 \\ -6 \end{pmatrix} + 3\begin{pmatrix} -6 \\ 8 \end{pmatrix}}{4} \tag{0.0.4}$$

$$\mathbf{D} = \frac{1}{2}\begin{pmatrix} -5 \\ 9 \end{pmatrix} \tag{0.0.5}$$

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

$$\mathbf{E} = \frac{1\mathbf{B} + 1\mathbf{A}}{2} \tag{0.0.6}$$

$$\mathbf{E} = \frac{1\begin{pmatrix} 8 \\ -6 \end{pmatrix} + 1\begin{pmatrix} -6 \\ 8 \end{pmatrix}}{2} \tag{0.0.7}$$

$$\mathbf{E} = \frac{1}{2}\begin{pmatrix} 2 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{0.0.8}$$

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

$$\mathbf{F} = \frac{3\mathbf{B} + 1\mathbf{A}}{4} \tag{0.0.9}$$

$$\mathbf{F} = \frac{3\begin{pmatrix} 8 \\ -6 \end{pmatrix} + 1\begin{pmatrix} -6 \\ 8 \end{pmatrix}}{4} \tag{0.0.10}$$

$$\mathbf{F} = \frac{1}{2}\begin{pmatrix} 9 \\ -5 \end{pmatrix} \tag{0.0.11}$$

Result

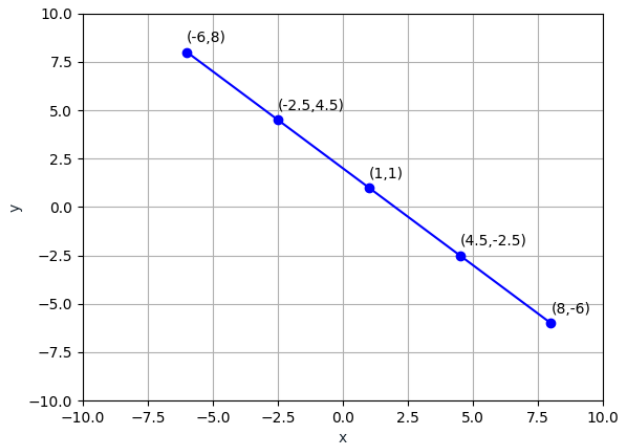Plot of coordinate of the points obtained from Python code is shown below.

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