Assignment 1

Anjali Bagade,EE21MTECH11001

vector

***Abstract*—This document contains the solution to find Internally and externally divided coordinate points.**

Download all python codes from

https://github.com/Anjalibagade/EE5600/tree/master/Assignment1

and latex codes from

https://github.com/Anjalibagade/EE5600/Assignment1

Problem

Vector-2, Example-1, Question-18

Find the coordinates of the point which divides, internally and externally, the line joining (-3,-4) to (-8,7) in the ratio 7:5

Solution:

Let us consider **S** and **T** are Vectors which divides **A** and **B** in the ratio of 7:5 gives internally and externally divided points respectively. Given that,

$$\mathbf{A} = \begin{pmatrix} -3 \\ -4 \end{pmatrix} \tag{0.0.1}$$

$$\mathbf{B} = \begin{pmatrix} -8 \\ 7 \end{pmatrix} \tag{0.0.2}$$

1) **Finding internal coordinate point :**
The coordinates of point **S** which divides the line joining **A** and **B** internally in the ratio m:n is given by the section formula

$$\mathbf{S} = \left(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right) \tag{0.0.3}$$

Rewrite above formula in terms of matrix

$$\mathbf{S} = \begin{pmatrix} \frac{m}{m+n} \\ \frac{n}{m+n} \end{pmatrix} \begin{pmatrix} x_2 & x_1 \\ y_2 & y_1 \end{pmatrix} \tag{0.0.4}$$

$$\mathbf{S} = \begin{pmatrix} \frac{m}{m+n} \\ \frac{n}{m+n} \end{pmatrix} \begin{pmatrix} \mathbf{B} & \mathbf{A} \end{pmatrix} \tag{0.0.5}$$

$$\mathbf{S} = \begin{pmatrix} \frac{7}{12} \\ \frac{5}{12} \end{pmatrix} \begin{pmatrix} -8 & -3 \\ 7 & -4 \end{pmatrix} \tag{0.0.6}$$

$$\implies \begin{pmatrix} \frac{7(-8)+5(-3)}{12} \\ \frac{7(7)+5(-4)}{12} \end{pmatrix} \tag{0.0.7}$$

$$\mathbf{S} = \begin{pmatrix} \frac{(-56)+(-15)}{12} \\ \frac{49+(-20)}{12} \end{pmatrix} \tag{0.0.8}$$

Solving above equation we get internally divided coordinate point

$$\mathbf{S} = \begin{pmatrix} \frac{-71}{12} \\ \frac{29}{12} \end{pmatrix} \tag{0.0.9}$$

Similarly,

2) **Finding external coordinate point :**
The coordinates of point **T** which divides the line joining points **A** and **B** externally in the ratio m:n is given by the section formula

$$\mathbf{T} = \left(\frac{mx_2-nx_1}{m-n}, \frac{my_2-ny_1}{m-n}\right) \tag{0.0.10}$$

Rewrite above formula in terms of matrix

$$\mathbf{T} = \begin{pmatrix} \frac{m}{m-n} \\ \frac{-n}{m-n} \end{pmatrix} \begin{pmatrix} x_2 & x_1 \\ y_2 & y_1 \end{pmatrix} \tag{0.0.11}$$

$$\mathbf{T} = \begin{pmatrix} \frac{m}{m-n} \\ \frac{-n}{m-n} \end{pmatrix} \begin{pmatrix} \mathbf{B} & \mathbf{A} \end{pmatrix} \tag{0.0.12}$$

$$\mathbf{T} = \begin{pmatrix} \frac{7}{2} \\ \frac{-5}{2} \end{pmatrix} \begin{pmatrix} -8 & -3 \\ 7 & -4 \end{pmatrix} \tag{0.0.13}$$

$$\implies \begin{pmatrix} \frac{7(-8)-5(-3)}{2} \\ \frac{7(7)-5(-4)}{2} \end{pmatrix} \tag{0.0.14}$$

$$\mathbf{T} = \begin{pmatrix} \frac{(-56)+15}{2} \\ \frac{49+20}{2} \end{pmatrix} \tag{0.0.15}$$

Solving above equation we get externally di-

vided coordinate point

$$\mathbf{T} = \begin{pmatrix} \frac{-41}{2} \\ \frac{69}{2} \end{pmatrix} \tag{0.0.16}$$

Result

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

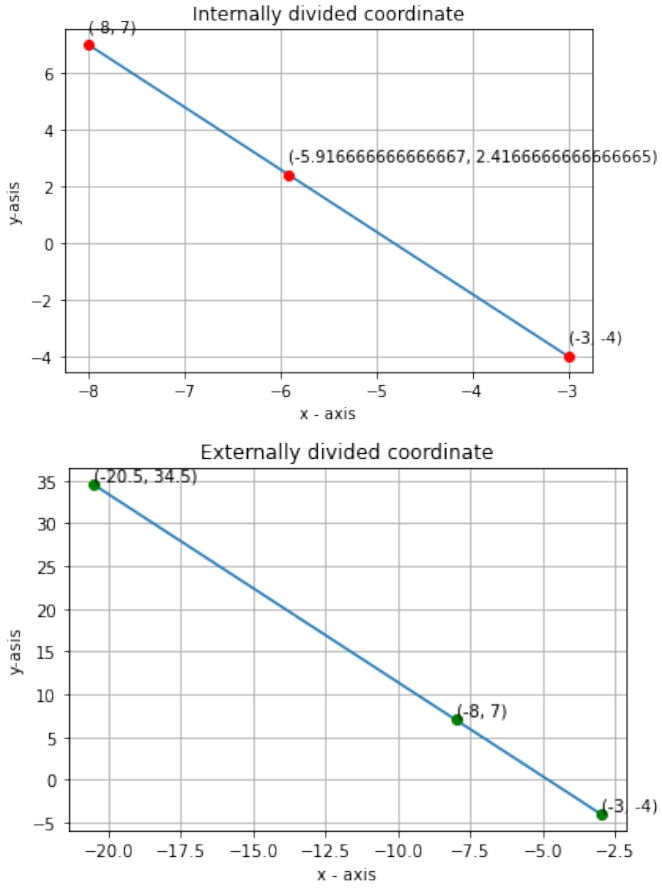

Fig. 2: Plot of coordinate of the point which divides internally and externally