

# ASSIGNMENT

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Question : Verify that

$$OA = OB = OC$$

**Solution:** From the previous results,

$$\mathbf{O}(\text{circumcentre}) = \begin{pmatrix} -\frac{53}{12} \\ \frac{5}{12} \end{pmatrix}$$

Calculating the  $OA$ ,  $OB$  and  $OC$ :-

$$\|OA\| = \sqrt{(A - O)^T(A - O)} \quad (3)$$

$$\|OB\| = \sqrt{(B - O)^T(B - O)} \quad (4)$$

$$\|OC\| = \sqrt{(C - O)^T(C - O)} \quad (5)$$

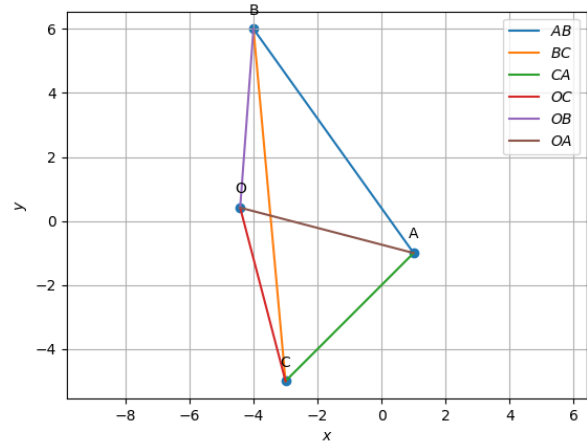


Fig. 0. Triangle generated using python

Solving for  $OA$ :-

$$\|OA\| = \sqrt{\begin{pmatrix} 1 + \frac{53}{12} \\ -1 - \frac{5}{12} \end{pmatrix} \begin{pmatrix} 1 + \frac{53}{12} & -1 - \frac{5}{12} \end{pmatrix}} \quad (6)$$

$$= \sqrt{\begin{pmatrix} \frac{65}{12} \\ -\frac{17}{12} \end{pmatrix} \begin{pmatrix} \frac{65}{12} & -\frac{17}{12} \end{pmatrix}} \quad (7)$$

$$= \sqrt{\left(\frac{65}{12}\right)^2 + \left(\frac{17}{12}\right)^2} \quad (8)$$

$$= 5.5988$$

$$\|OC\| = \sqrt{\begin{pmatrix} -3 + \frac{53}{12} \\ -5 - \frac{5}{12} \end{pmatrix} \begin{pmatrix} -3 + \frac{53}{12} & -5 - \frac{5}{12} \end{pmatrix}} \quad (14)$$

$$= \sqrt{\begin{pmatrix} \frac{17}{12} \\ -\frac{65}{12} \end{pmatrix} \begin{pmatrix} \frac{17}{12} & -\frac{65}{12} \end{pmatrix}} \quad (15)$$

$$= \sqrt{\left(\frac{17}{12}\right)^2 + \left(\frac{65}{12}\right)^2} \quad (16)$$

$$= 5.5988 \quad (17)$$

(9) Hence, from (9), (13) and (17), it can be concluded that,

$$OA = OB = OC \quad (18)$$

Hence verified.

Solving for  $OB$ :-

$$\|OB\| = \sqrt{\begin{pmatrix} -4 + \frac{53}{12} \\ 6 - \frac{5}{12} \end{pmatrix} \begin{pmatrix} -4 + \frac{53}{12} & 6 - \frac{5}{12} \end{pmatrix}} \quad (10)$$

$$= \sqrt{\begin{pmatrix} \frac{5}{12} \\ \frac{67}{12} \end{pmatrix} \begin{pmatrix} \frac{5}{12} & \frac{67}{12} \end{pmatrix}} \quad (11)$$

$$= \sqrt{\left(\frac{5}{12}\right)^2 + \left(\frac{67}{12}\right)^2} \quad (12)$$

$$= 5.5988 \quad (13)$$

Solving for  $OC$ :-