ASSIGNMENT

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Question : Verify that

$$OA = OB = OC \tag{1}$$

Solution: From the previous results,

$$\mathbf{O}(circumcentre) = \begin{pmatrix} \frac{-53}{12} \\ \frac{5}{12} \end{pmatrix} \tag{2}$$

Calculating the OA, OB and OC:-

$$\|OA\| = \sqrt{(A-O)^\top (A-O)} \tag{3}$$

$$\|OB\| = \sqrt{(B-O)^\top (B-O)} \tag{4}$$

$$\|OC\| = \sqrt{(C-O)^\top (C-O)} \tag{5}$$

Solving for OA:-

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

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

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

$$= 5.5988 \tag{9}$$

Solving for OB:-

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

$$= \sqrt{\begin{pmatrix} \frac{5}{12} \\ \frac{67}{12} \end{pmatrix}\begin{pmatrix} \frac{5}{12} & \frac{67}{12} \end{pmatrix}} \tag{11}$$

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

$$= 5.5988 \tag{13}$$

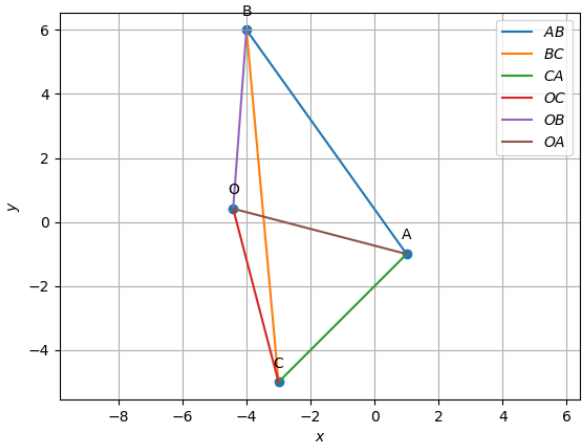

Fig. 0. Triangle generated using python

Solving for OC:-

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

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

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

$$= 5.5988 \tag{17}$$

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

$$OA = OB = OC \tag{18}$$

Hence verified.