EE23010 Assignment

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Consider a triangle with vertices:

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \tag{1}$$

I. VECTORS

parameter	value	description
$\mathbf{m_1}$	$\begin{pmatrix} -5 \\ 4 \end{pmatrix}$	Parametric and normal form of AB
$\mathbf{n_1^\top}$	$\begin{pmatrix} 4 & 5 \end{pmatrix}$	
c_1	-21	
$\|\mathbf{B}-\mathbf{A}\|$	6.40	Length of AB
$\mathbf{m_2}$	$\begin{pmatrix} 9 \\ 6 \end{pmatrix}$	Parametric and normal form of BC
$\mathbf{n_2^\top}$	$\begin{pmatrix} 6 & -9 \end{pmatrix}$	
c_2	-15	
$\|\mathbf{C}-\mathbf{B}\|$	10.81	Length of BC
$\mathbf{m_3}$	$\begin{pmatrix} -4 \\ -10 \end{pmatrix}$	Parametric and normal form of CA
$\mathbf{n_3^\top}$	$\begin{pmatrix} -10 & 4 \end{pmatrix}$	
c_3	-30	
$\|\mathbf{A}-\mathbf{C}\|$	10.77	Length of CA
rank	3	$\mathbf{A}, \mathbf{B}$ and $\mathbf{C}$ are non collinear
area	33	Area of Triangle $\triangle ABC$
$\angle A$	73.1416	Angle
$\angle B$	72.3498	
$\angle C$	34.5085	

TABLE I.1
VECTORS

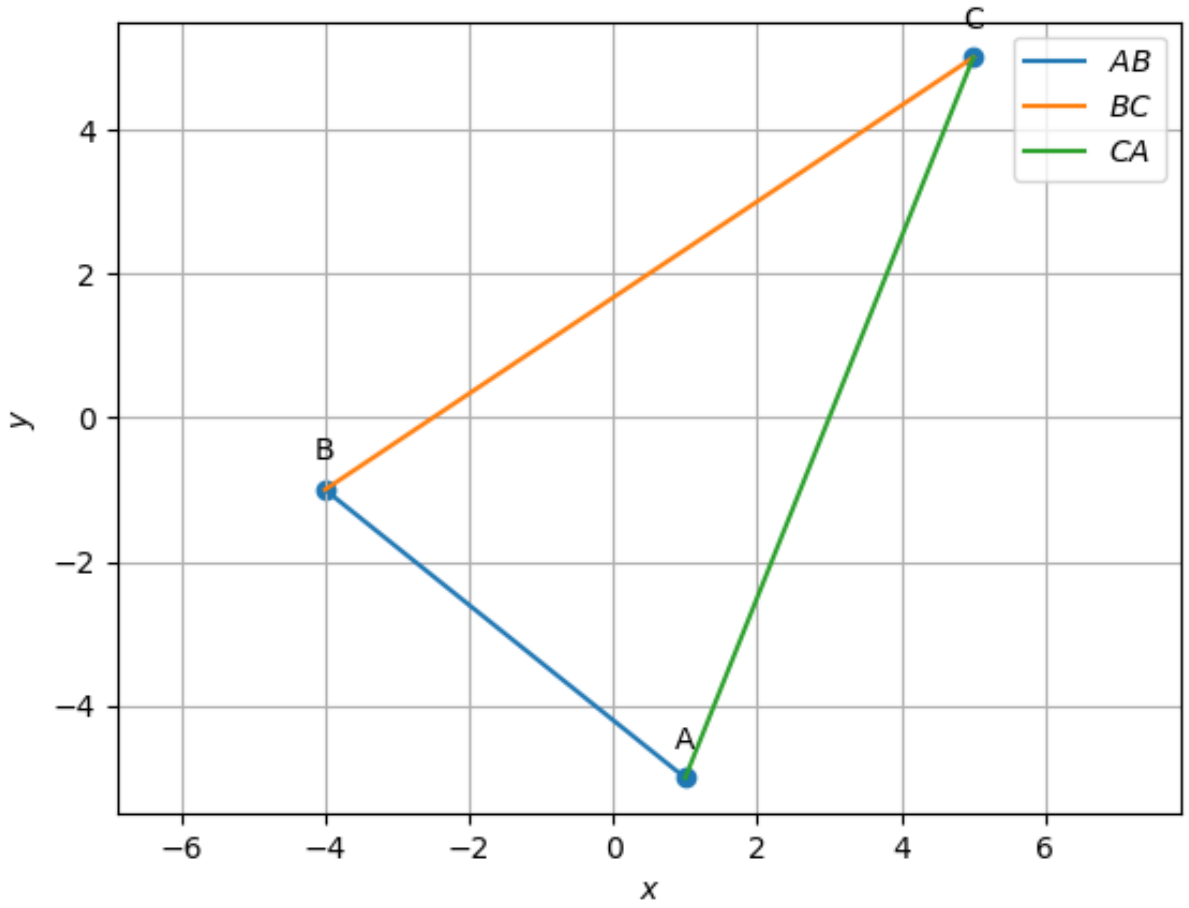

Fig. I.1. Triangle ABC ($\triangle ABC$)

II. MEDIAN

parameter	value	description
D	$\begin{pmatrix} 0.5 \\ 2 \end{pmatrix}$	Midpoint of AD
E	$\begin{pmatrix} 3 \\ 0 \end{pmatrix}$	Midpoint of BE
F	$\begin{pmatrix} -1.5 \\ -3 \end{pmatrix}$	Midpoint of CF
$\mathbf{n_1^\top}$	$\begin{pmatrix} 7 & 0.5 \end{pmatrix}$	normal form of AD
c_1	4.5	
$\mathbf{n_2^\top}$	$\begin{pmatrix} 1 & 7 \end{pmatrix}$	normal form of BE
c_2	3	
$\mathbf{n_3^\top}$	$\begin{pmatrix} -8 & 6.5 \end{pmatrix}$	normal form of CF
c_3	−7.5	
G	$\begin{pmatrix} 0.66 \\ -0.33 \end{pmatrix}$	Centroid of the triangle

TABLE II.1
MEDIAN

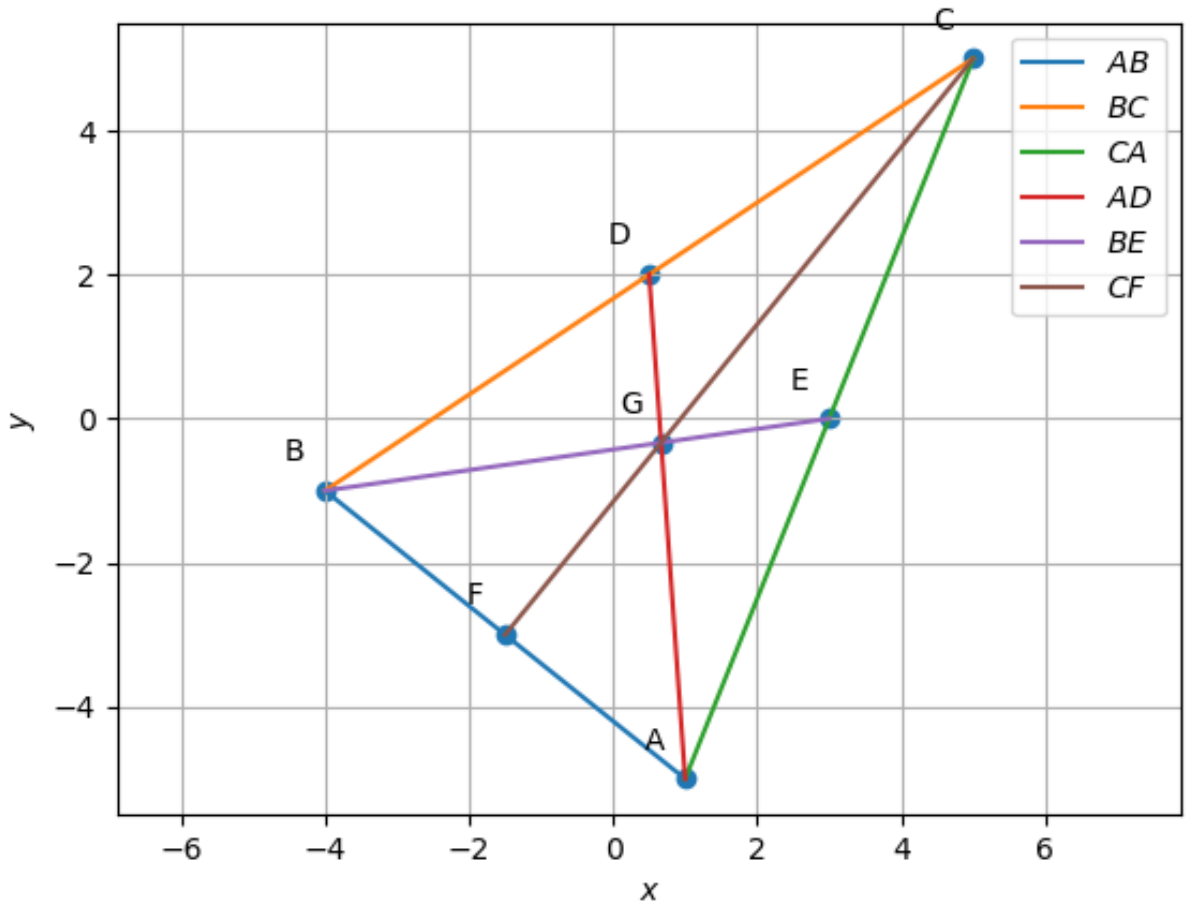

Fig. II.1. Medians AD, BE and CF with centroid **G** of $\triangle ABC$

III. ALTITUDE

parameter	**value**	**description**
$\mathbf{n_1^\top}$	$\begin{pmatrix} 9 & 6 \end{pmatrix}$	normal form of AD_1
c_1	-21	
$\mathbf{n_2^\top}$	$\begin{pmatrix} -4 & -10 \end{pmatrix}$	normal form of BE_1
c_2	26	
$\mathbf{n_3^\top}$	$\begin{pmatrix} -5 & 4 \end{pmatrix}$	normal form of CF_1
c_3	-5	
H	$\begin{pmatrix} 2.833 \\ -0.833 \end{pmatrix}$	Orthocentre of Triangle

TABLE III.1
ALTITUDE

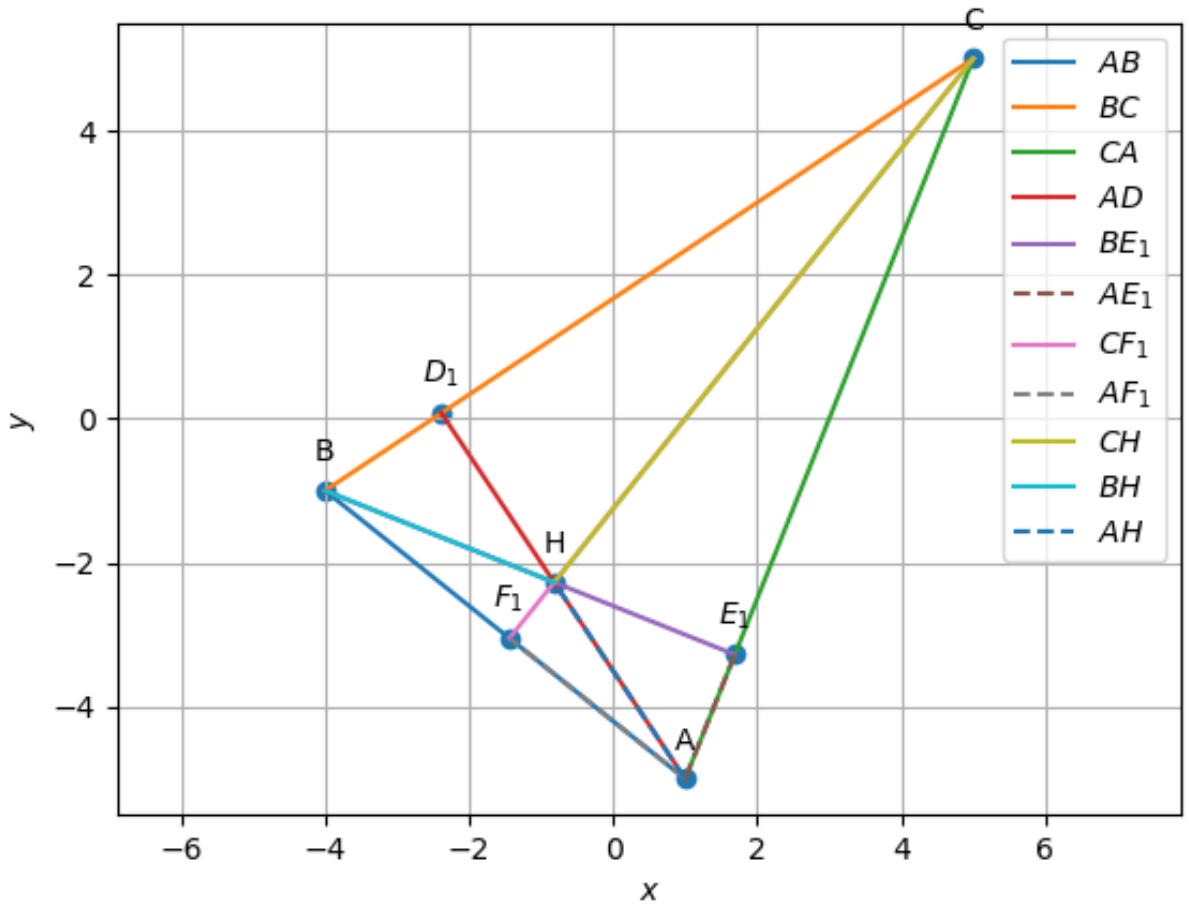

Fig. III.1. Altitudes AD_1, BE_1 and CF_1 with orthocentre **H** of $\triangle ABC$

IV. PERPENDICULAR BISECTOR

parameter	**value**	**description**
$\mathbf{n_1}^\top$	$\begin{pmatrix}5 & -4\end{pmatrix}$	Perpendicular bisector of AB
c_1	4.5	
$\mathbf{n_2}^\top$	$\begin{pmatrix}-9 & -16\end{pmatrix}$	Perpendicular bisector of BC
c_2	-16.5	
$\mathbf{n_3}^\top$	$\begin{pmatrix}4 & 10\end{pmatrix}$	Perpendicular bisector of CA
c_3	12	
O	$\begin{pmatrix}1.40\\0.63\end{pmatrix}$	Circumcircle and Circumradius
radius	5.65	

TABLE IV.1
PERPENDICULAR BISECTOR

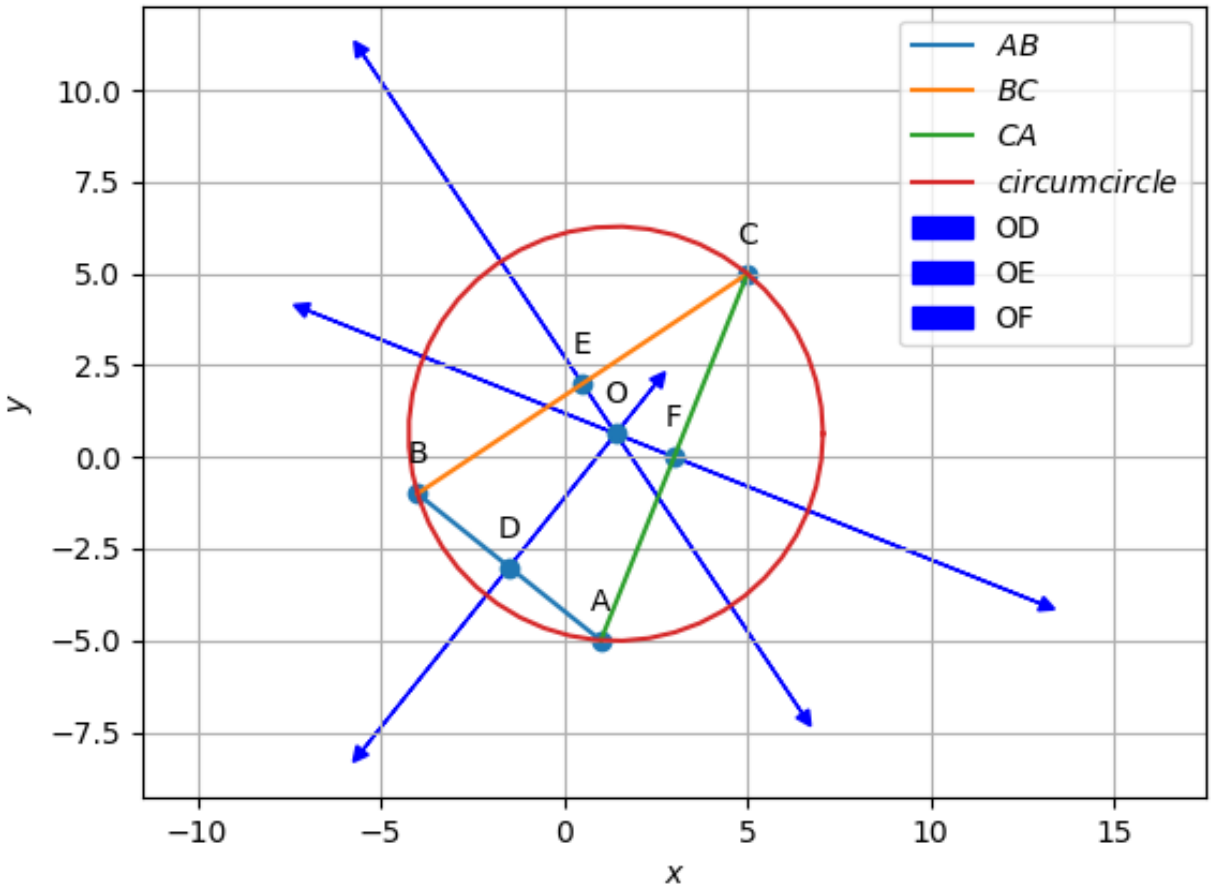

Fig. IV.1. Perpendicular bisectors OD, OE and OF with circumcentre **O** of $\triangle ABC$

V. Angle Bisector

parameter	value	description
$\mathbf{n_1}^\top$	$\begin{pmatrix}1.55 & 0.40\end{pmatrix}$	Angular bisector of $\angle A$
c_1	-0.49	
$\mathbf{n_2}^\top$	$\begin{pmatrix}-0.06 & -1.61\end{pmatrix}$	Angular bisector of $\angle B$
c_2	1.89	
$\mathbf{n_3}^\top$	$\begin{pmatrix}-1.48 & 1.20\end{pmatrix}$	Angular bisector of $\angle C$
c_3	-1.39	
I	$\begin{pmatrix}-0.008\\-1.173\end{pmatrix}$	Incircle and Inradius
radius	2.35	

TABLE V.1
Angle Bisector

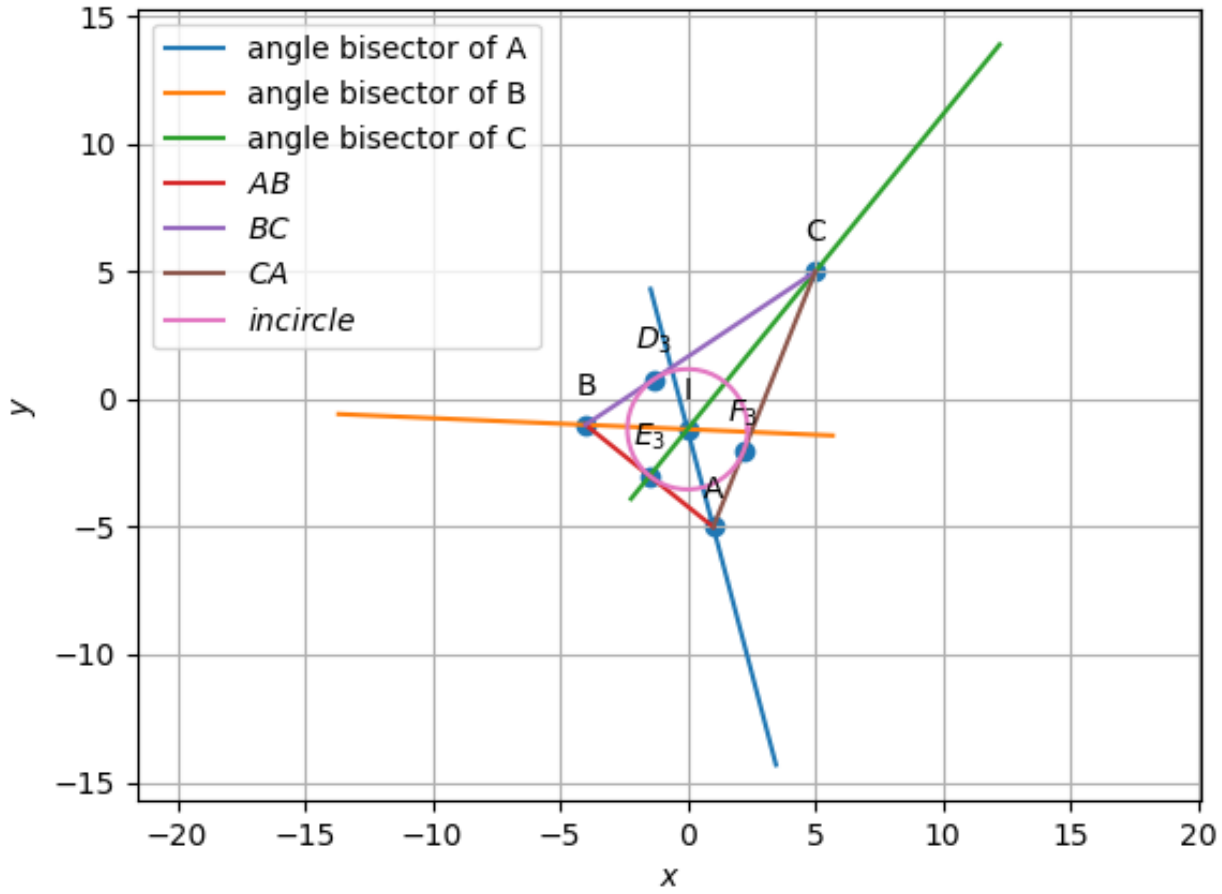

Fig. V.1. Angle bisectors of $\angle A$, $\angle B$ and $\angle C$ with incentre **I** of $\triangle ABC$