Answer Key

Sameer Kendal - EE22BTECH11044*

Consider the vertices,

$$\mathbf{A} = \begin{pmatrix} -5 \\ 4 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} 5 \\ -1 \end{pmatrix} \tag{2}$$

$$\mathbf{C} = \begin{pmatrix} -1 \\ -3 \end{pmatrix} \tag{3}$$

I. VECTORS

Parameter	Value	Description
$\mathbf{m_1}$	$\begin{pmatrix} 10 \\ -5 \end{pmatrix}$	AB
$\mathbf{m_2}$	$\begin{pmatrix} -6 \\ -2 \end{pmatrix}$	BC
$\mathbf{m_3}$	$\begin{pmatrix} -4 \\ 7 \end{pmatrix}$	AC
$\|\|B-A\|\|$	11.80	AB
$\|\|C-B\|\|$	6.32	BC
$\|\|A-C\|\|$	8.06	AC
rank	3	points are not collinear
$\mathbf{n_1}^\top$	$\begin{pmatrix} -5 & -10 \end{pmatrix}$	AB
c_1	-15	
$\mathbf{n_2}^\top$	$\begin{pmatrix} -2 & 6 \end{pmatrix}$	BC
c_2	-16	
$\mathbf{n_3}^\top$	$\begin{pmatrix} 7 & 4 \end{pmatrix}$	AC
c_3	-19	
area	25.00	area of triangle
$\angle A$	33.69°	Angle
$\angle B$	45.00°	
$\angle C$	101.30°	

TABLE I.1
VECTORS

II. MEDIANS

Parameter	Value	Description
D	$\begin{pmatrix} 2.0 \\ -2.0 \end{pmatrix}$	midpoint of line BC
E	$\begin{pmatrix} -3.0 \\ 0.5 \end{pmatrix}$	midpoint of line AC
F	$\begin{pmatrix} 0 \\ 1.5 \end{pmatrix}$	midpoint of line AB
$\mathbf{n_4^\top}$	$\begin{pmatrix} -6 & -7 \end{pmatrix}$	AD
c_4	2	
$\mathbf{n_5^\top}$	$\begin{pmatrix} 1.5 & 8 \end{pmatrix}$	BE
c_5	-0.5	
$\mathbf{n_6^\top}$	$\begin{pmatrix} 4.5 & -1 \end{pmatrix}$	CF
c_6	-1.5	
G	$\begin{pmatrix} -0.33 \\ -6.93 \end{pmatrix}$	centroid of triangle

TABLE II.1
MEDIAN

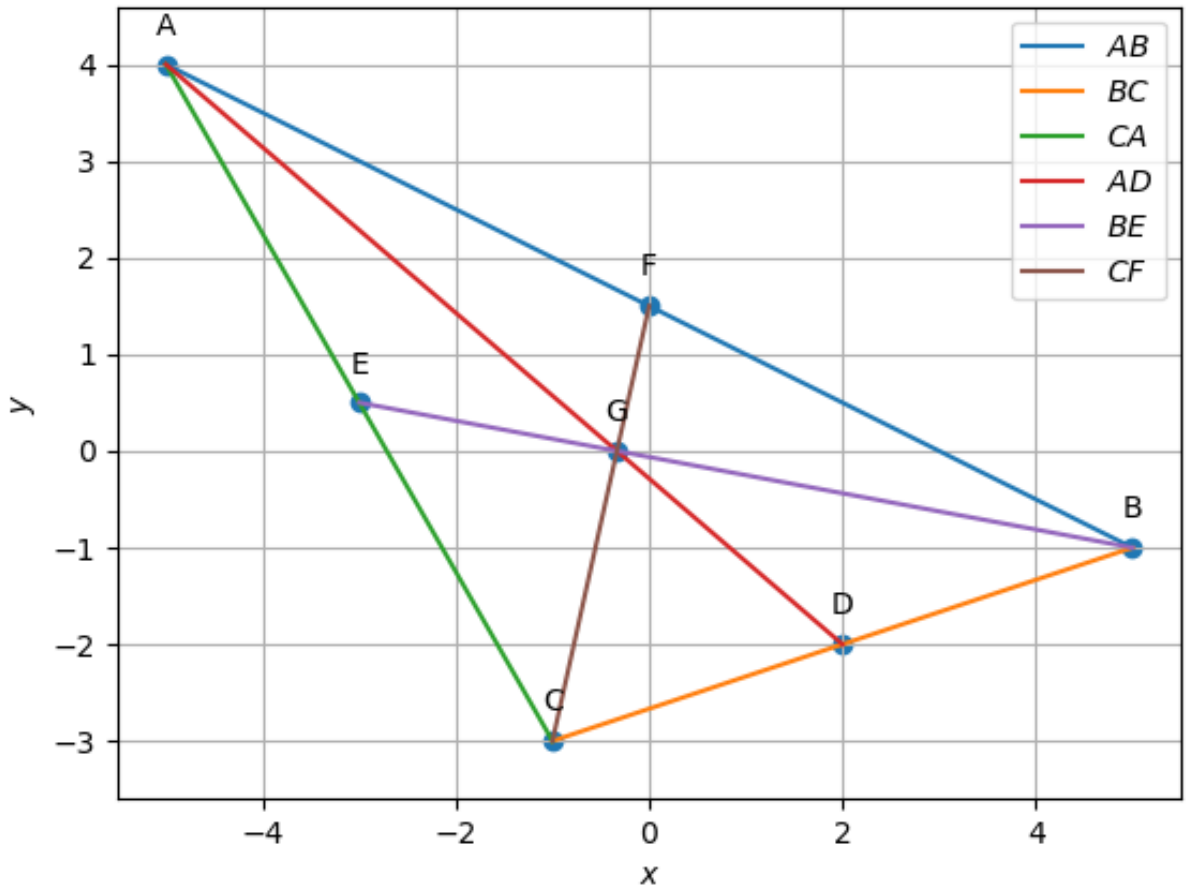

Fig. II.1. Triangle ABC with medians AD, BE and CF

III. ALTITUDES

Parameter	Value	Description
$\mathbf{n_7}^\top$	$\begin{pmatrix}-6 & -2\end{pmatrix}$	AD_1
c_7	22	
$\mathbf{n_8}^\top$	$\begin{pmatrix}-4 & 7\end{pmatrix}$	BE_1
c_8	-27	
$\mathbf{n_9}^\top$	$\begin{pmatrix}10 & -5\end{pmatrix}$	CF_1
c_9	5	
$\mathbf{H}$	$\begin{pmatrix}-2. \\ -5\end{pmatrix}$	orthocentre of triangle

TABLE III.1
ALTITUDES

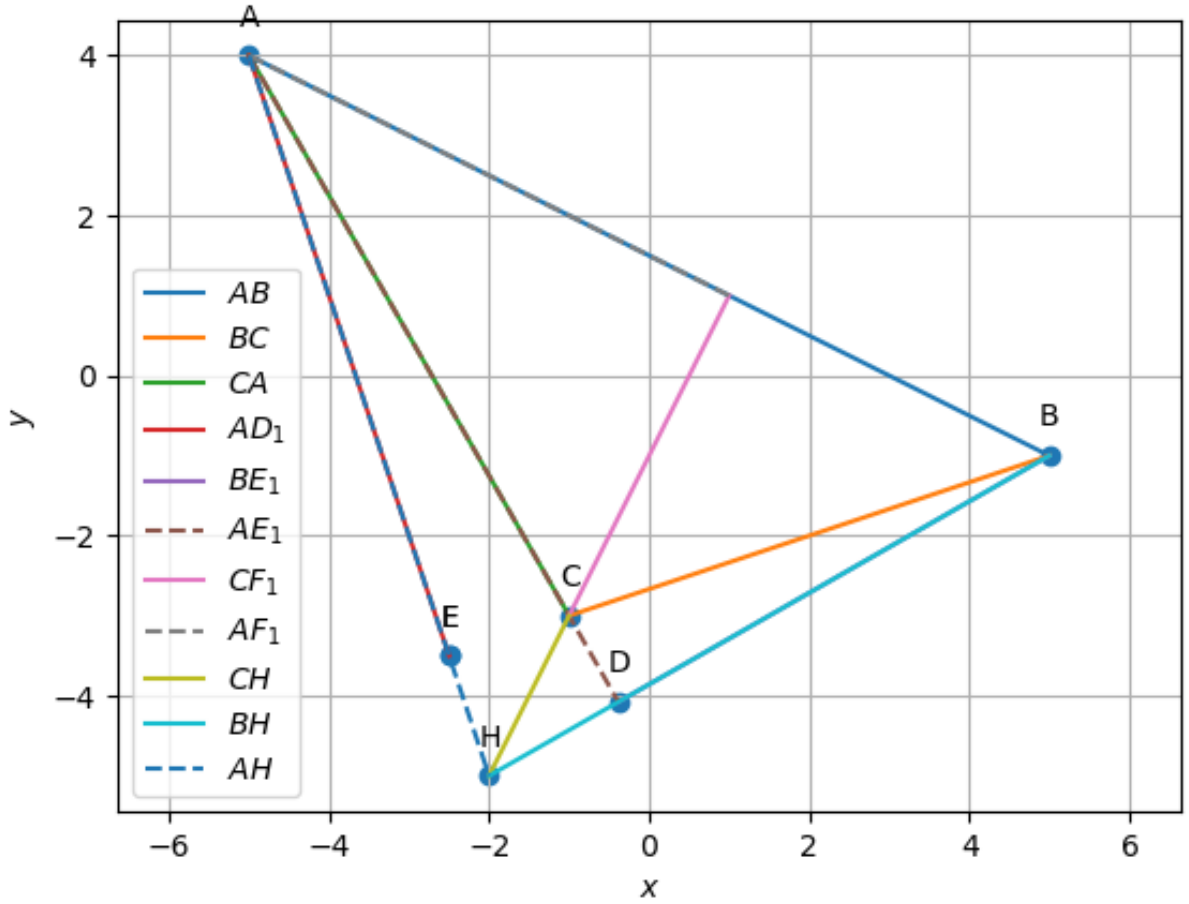

Fig. III.1. Triangle ABC with altitudes AD_1, BE_1 and CF_1

IV. PERPENDICULAR BISECTOR

Parameter	Value	Description
$\mathbf{n}_{10}^{\top}$	$\begin{pmatrix}-10 & 5\end{pmatrix}$	Perpendicular bisector of AB
c_{10}	7.5	
$\mathbf{n}_{11}^{\top}$	$\begin{pmatrix}6 & 2\end{pmatrix}$	Perpendicular bisector of BC
c_{11}	8	
$\mathbf{n}_{12}^{\top}$	$\begin{pmatrix}4 & -7\end{pmatrix}$	Perpendicular bisector of CA
c_{12}	-15.5	
O	$\begin{pmatrix}0.5\\2.5\end{pmatrix}$	Circumcircle
radius	5.70	

TABLE IV.1
PERPENDICULAR BISECTOR

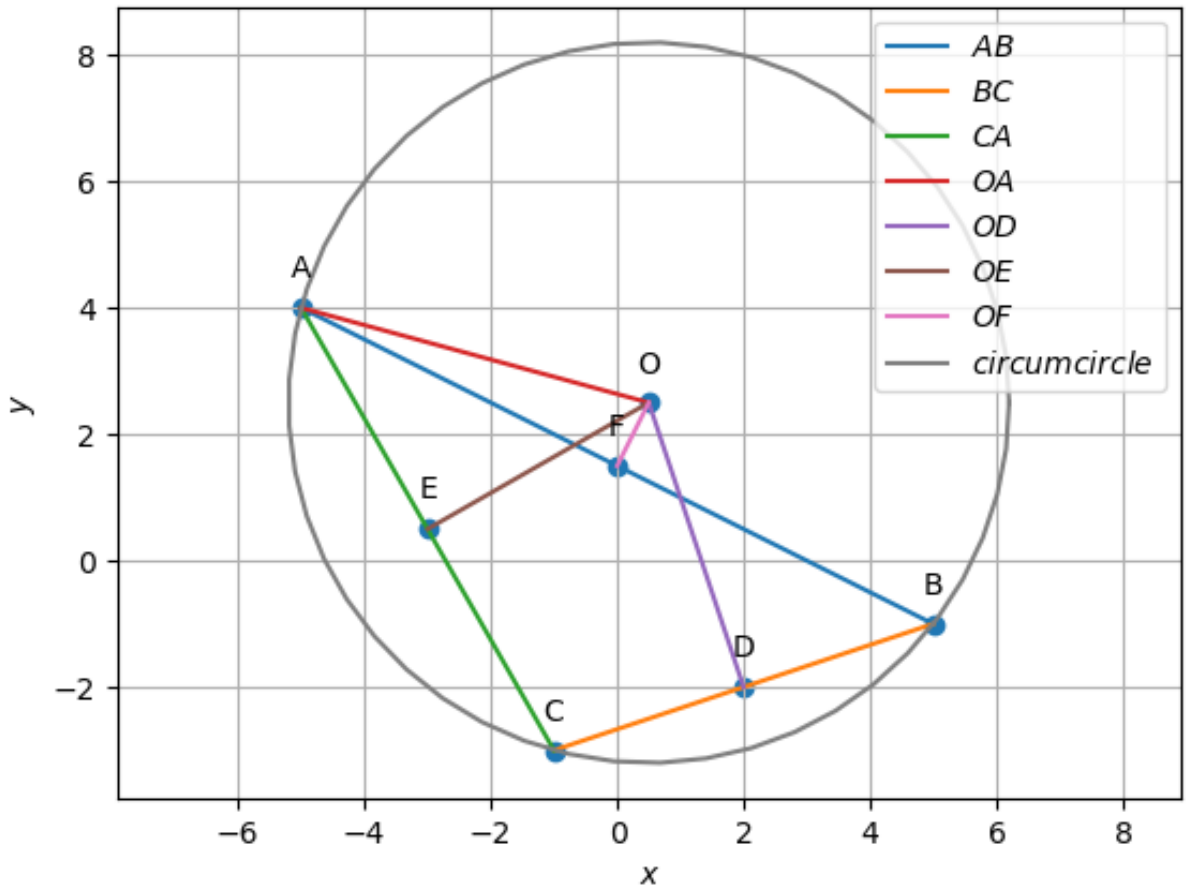

Fig. IV.1. circumcircle of triangle ABC with circumcentre O

V. ANGULAR BISECTOR

Parameter	Value	Description
$\mathbf{n}_{13}^{\top}$	$\begin{pmatrix}-1.315 & -1.39\end{pmatrix}$	Angular bisector of A
c_{13}	1.015	
$\mathbf{n}_{14}^{\top}$	$\begin{pmatrix}0.13 & 1.84\end{pmatrix}$	Angular bisector of B
c_{14}	-1.18	
$\mathbf{n}_{15}^{\top}$	$\begin{pmatrix}1.184 & -0.45\end{pmatrix}$	Angular bisector of C
c_{15}	-7.73	
$\mathbf{I}$	$\begin{pmatrix}-0.09 \\ -0.637\end{pmatrix}$	Incircle
radius	-1.955	

TABLE V.1
ANGULAR BISECTOR

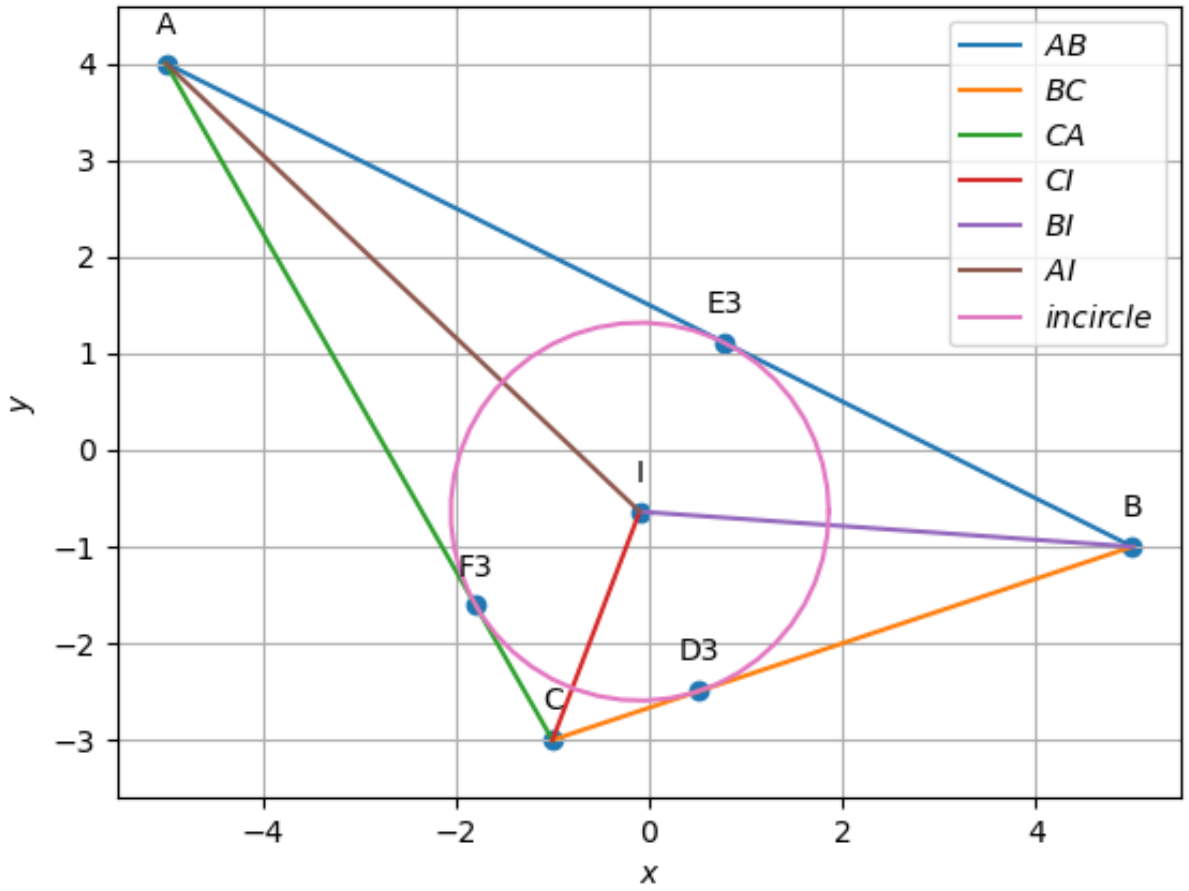

Fig. V.1. incircle of triangle ABC with incentre I