

Answer Key Table

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Consider the vertices,

$$\mathbf{A} = \begin{pmatrix} -6 \\ -3 \end{pmatrix} \quad (1)$$

$$\mathbf{B} = \begin{pmatrix} -1 \\ 0 \end{pmatrix} \quad (2)$$

$$\mathbf{C} = \begin{pmatrix} 3 \\ -5 \end{pmatrix} \quad (3)$$

I. VECTORS

parameter	value	description
\mathbf{m}_1	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	direction vector of line AB
\mathbf{m}_2	$\begin{pmatrix} 4 \\ -5 \end{pmatrix}$	direction vector of line BC
\mathbf{m}_3	$\begin{pmatrix} -9 \\ 2 \end{pmatrix}$	direction vector of line AC
$\ \mathbf{B} - \mathbf{A}\ $	5.83	length of line AB
$\ \mathbf{C} - \mathbf{B}\ $	6.40	length of line BC
$\ \mathbf{A} - \mathbf{C}\ $	9.21	length of line AC
rank	3	points are not collinear
\mathbf{n}_1^\top	$\begin{pmatrix} 3 & -5 \end{pmatrix}$	normal vector of line AB
c_1	-3	constant of line AB
\mathbf{n}_2^\top	$\begin{pmatrix} -5 & -4 \end{pmatrix}$	normal vector of line BC
c_2	5	constant of line BC
\mathbf{n}_3^\top	$\begin{pmatrix} 2 & 9 \end{pmatrix}$	normal vector of line AC
c_3	-39	constant of line AC
area	18.5	area of triangle
$\angle A$	43.49°	Angle
$\angle B$	97.69°	
$\angle C$	38.81°	

TABLE I.1
VECTORS

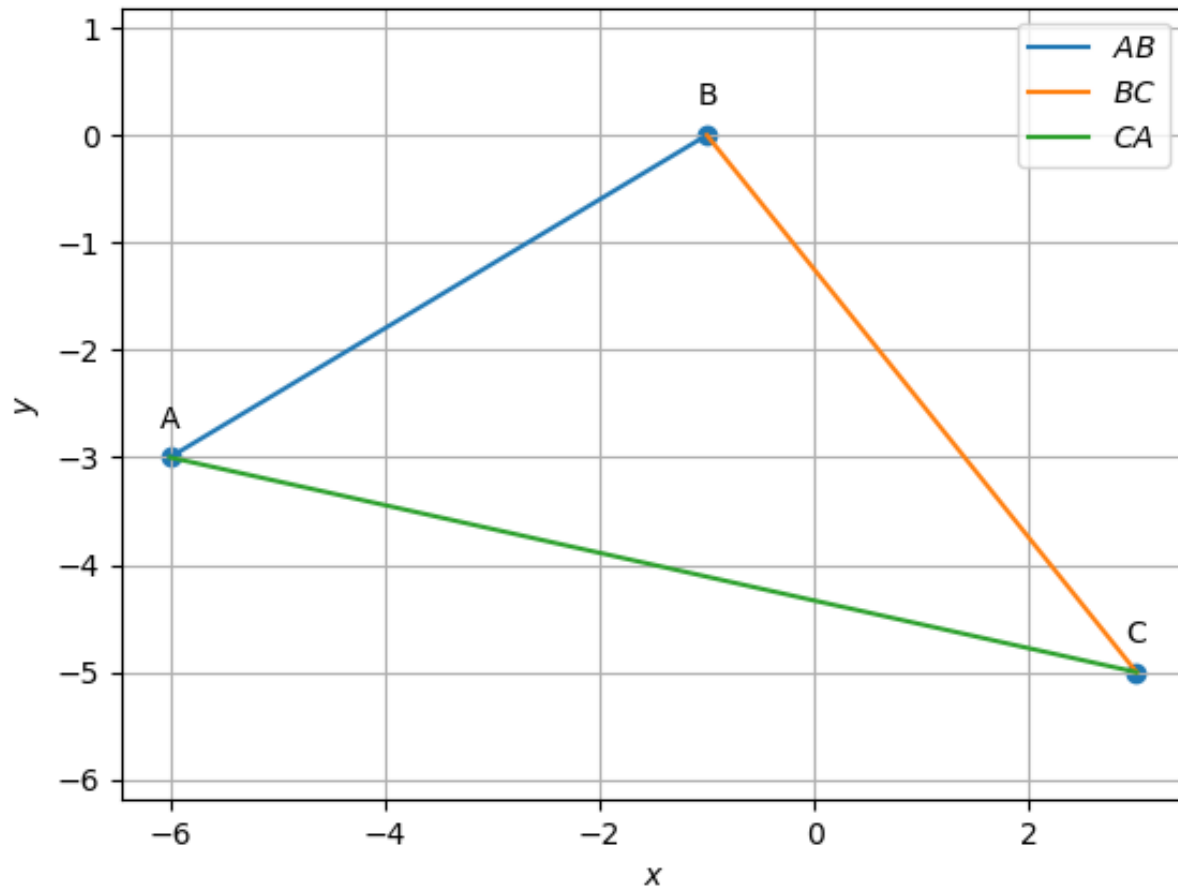


Fig. I.1. Triangle ABC

II. MEDIANS

parameter	value	description
D	$\begin{pmatrix} 1 \\ -2.5 \end{pmatrix}$	midpoint of line BC
E	$\begin{pmatrix} -1.5 \\ -4 \end{pmatrix}$	midpoint of line AC
F	$\begin{pmatrix} -3.5 \\ -1.5 \end{pmatrix}$	midpoint of line AB
\mathbf{n}_4^T	$(0.5 \quad -7)$	normal vector of line AD
c_4	18	constant of line AD
\mathbf{n}_5^T	$(-4 \quad 0.5)$	normal vector of line BE
c_5	4	constant of line BE
\mathbf{n}_6^T	$(3.5 \quad 6.5)$	normal vector of line CF
c_6	-22	constant of line CF
G	$\begin{pmatrix} -1.33 \\ -2.66 \end{pmatrix}$	centroid of triangle

TABLE II.1
MEDIANS

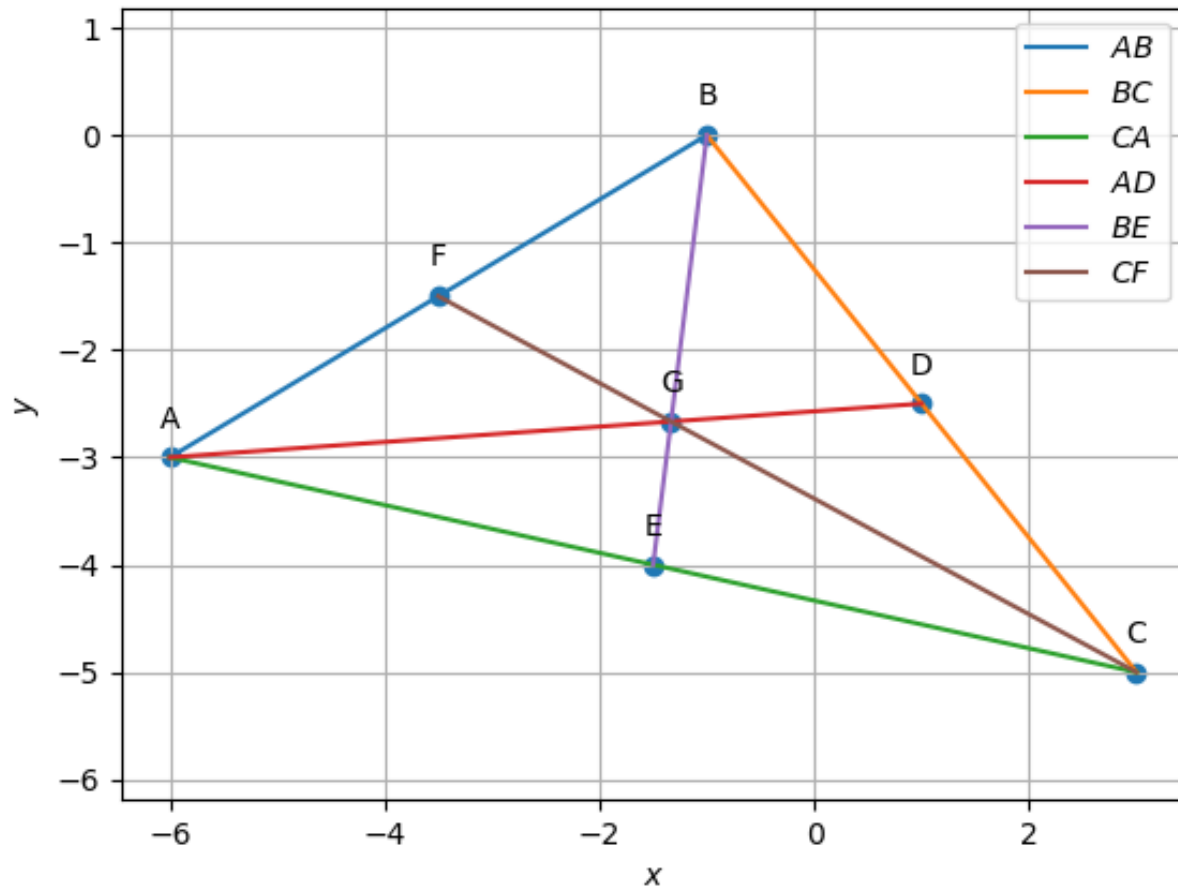


Fig. II.1. Triangle ABC with medians AD, BE and CF

III. ALTITUDES

parameter	value	description
\mathbf{n}_7^T	$(4 \ -5)$	normal vector of line AD_1
c_7	-9	constant of line AD_1
\mathbf{n}_8^T	$(-9 \ 2)$	normal vector of line BE_1
c_8	9	constant of line BE_1
\mathbf{n}_9^T	$(5 \ 3)$	normal vector of line CF_1
c_9	0	constant of line CF_1
H	$\begin{pmatrix} -0.73 \\ 1.21 \end{pmatrix}$	orthocentre of triangle

TABLE III.1
ALTITUDES

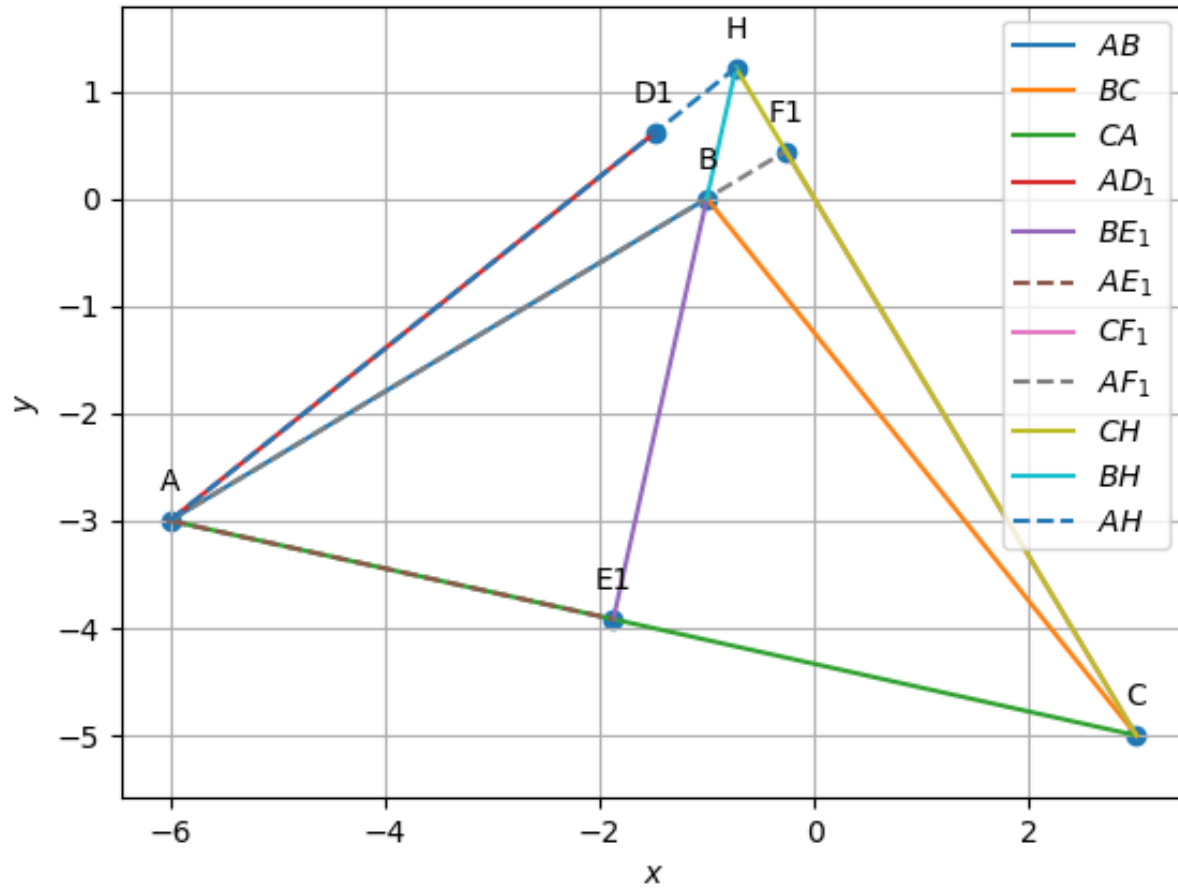


Fig. III.1. Triangle ABC with altitudes AD_1 , BE_1 and CF_1

IV. PERPENDICULAR BISECTOR

parameter	value	description
\mathbf{n}_{10}^T	$(-5 \ -3)$	normal vector of Perpendicular bisector of AB
c_{10}	22	constant of Perpendicular bisector of AB
\mathbf{n}_{11}^T	$(-4 \ 5)$	normal vector of Perpendicular bisector of BC
c_{11}	-16.5	constant of Perpendicular bisector of BC
\mathbf{n}_{12}^T	$(9 \ -2)$	normal vector of Perpendicular bisector of CA
c_{12}	-5.5	constant of Perpendicular bisector of AC
\mathbf{O}	$\begin{pmatrix} -1.63 \\ -4.60 \end{pmatrix}$	Circumcircle
radius	4.65	

TABLE IV.1
PERPENDICULAR BISECTORS

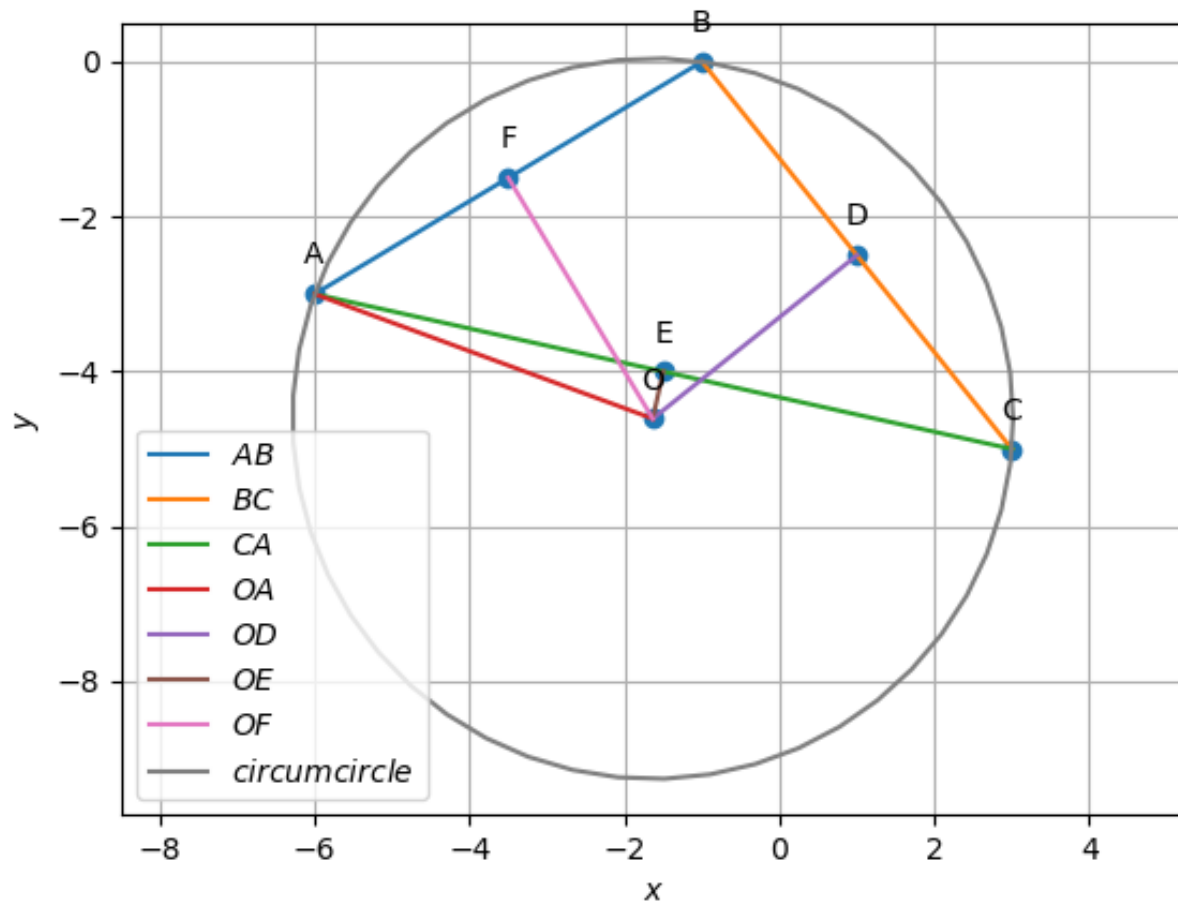


Fig. IV.1. circumcircle of triangle ABC with circumcentre O

V. ANGULAR BISECTOR

parameter	value	description
\mathbf{n}_{13}^\top	$(0.29 \quad -1.83)$	normal vector of Angular bisector of $\angle A$
c_{13}	3.71	constant of Angular bisector of $\angle A$
\mathbf{n}_{14}^\top	$(-1.29 \quad 0.23)$	normal vector of Angular bisector of $\angle B$
c_{14}	1.29	constant of Angular bisector of $\angle B$
\mathbf{n}_{15}^\top	$(0.99 \quad 1.60)$	normal vector of Angular bisector of $\angle C$
c_{15}	-10.78	constant of Angular bisector of $\angle C$
\mathbf{I}	$\begin{pmatrix} -1.40 \\ -2.25 \end{pmatrix}$	Incircle
radius	1.72	
\mathbf{D}_3	$\begin{pmatrix} -0.05 \\ -1.17 \end{pmatrix}$	points of contact of incircle
\mathbf{E}_3	$\begin{pmatrix} -2.29 \\ -0.77 \end{pmatrix}$	
\mathbf{F}_3	$\begin{pmatrix} -1.77 \\ -3.93 \end{pmatrix}$	

TABLE V.I
ANGULAR BISECTORS

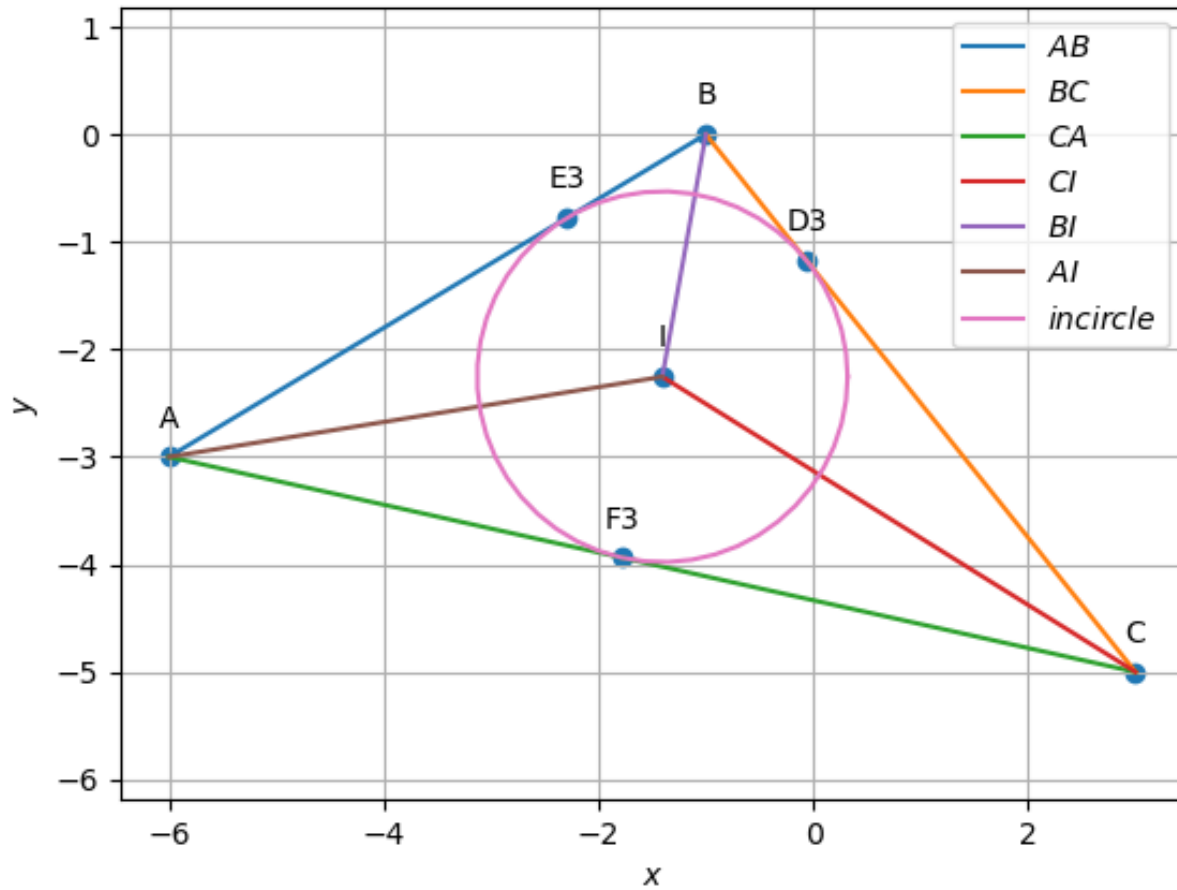


Fig. V.1. incircle of triangle ABC with incentre I