

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	$\begin{pmatrix} -1 \\ -5 \end{pmatrix}$	Direction vector of AB
\mathbf{m}_2	$\begin{pmatrix} 4 \\ -6 \end{pmatrix}$	Direction vector of BC
\mathbf{m}_3	$\begin{pmatrix} -1 \\ -1 \end{pmatrix}$	Direction vector of CA
Length of Side	5.1	AB
Length of Side	7.07	BC
Length of Side	4	CA
n^\top	$\begin{pmatrix} -1 & -5 \end{pmatrix}$	AB
c	26	
n^\top	$\begin{pmatrix} 5 & 5 \end{pmatrix}$	BC
c	-10	
n^\top	$\begin{pmatrix} -4 & 0 \end{pmatrix}$	CA
c	4	
Area	10	ABC
Angle	101.31	A
Angle	33.69	B
Angle	45	C

TABLE 0

TABLE 1

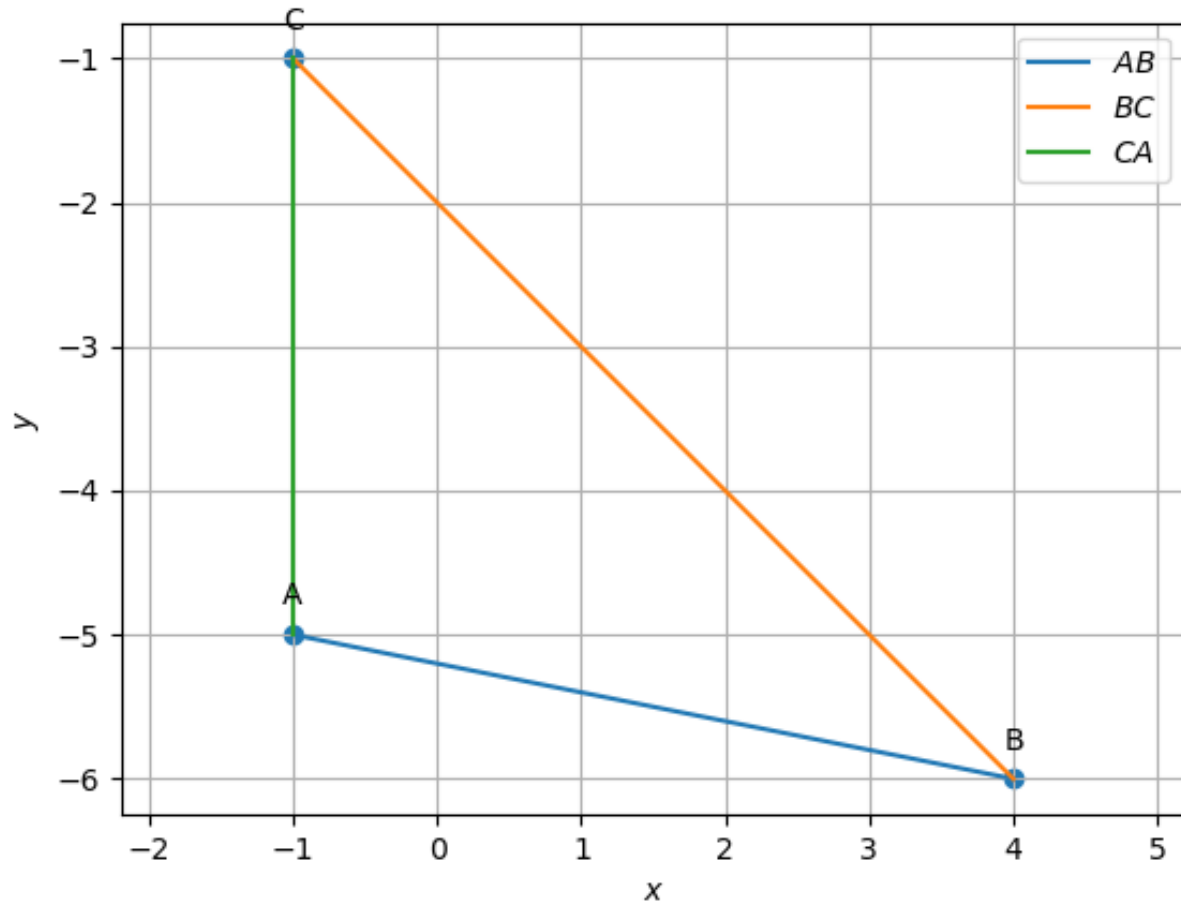


Fig. 0. Triangle ABC

II. MEDIANS

Parameter	Value	Description
Coordinates	$\begin{pmatrix} 1.5 \\ -3.5 \end{pmatrix}$	D (midpoint of AB)
Coordinates	$\begin{pmatrix} -1 \\ -3 \end{pmatrix}$	E (midpoint of BC)
Coordinates	$\begin{pmatrix} 1.5 \\ -5.5 \end{pmatrix}$	F (midpoint of CA)
n^T	$\begin{pmatrix} 1.5 & -2.5 \end{pmatrix}$	AD
c	11	
n^T	$\begin{pmatrix} 3 & 5 \end{pmatrix}$	BE
c	-18	
n^T	$\begin{pmatrix} -4.5 & -2.5 \end{pmatrix}$	CF
c	7	
Orthocentre (G)	$\begin{pmatrix} 0.67 \\ -4 \end{pmatrix}$	Point of intersection of BE and CF

TABLE 0

TABLE 2

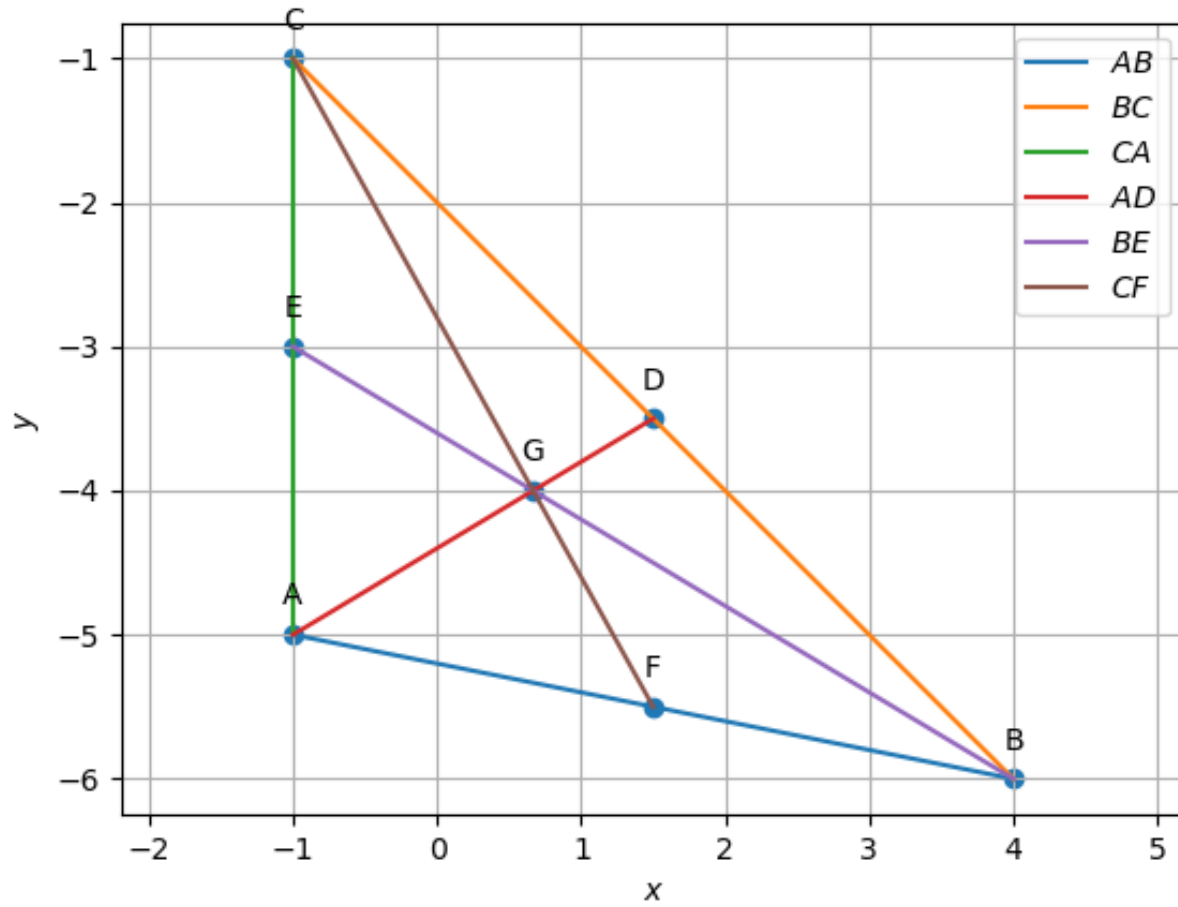


Fig. 0. Triangle ABC with medians AD, BE and CF

III. ALTITUDES

Parameter	Value	Description
\mathbf{n}	$\begin{pmatrix} 5 \\ -5 \end{pmatrix}$	Normal Vector of AD_1
n^T	$(-5 \ 5)$	AD_1
c	-20	
n^T	$(0 \ -4)$	BE_1
c	24	
n^T	$(5 \ -1)$	CF_1
c	-4	
Orthocentre (\mathbf{H})	$(-2 \ -6)$	Intersection of BE_1 and CF_1

TABLE 0

TABLE 3

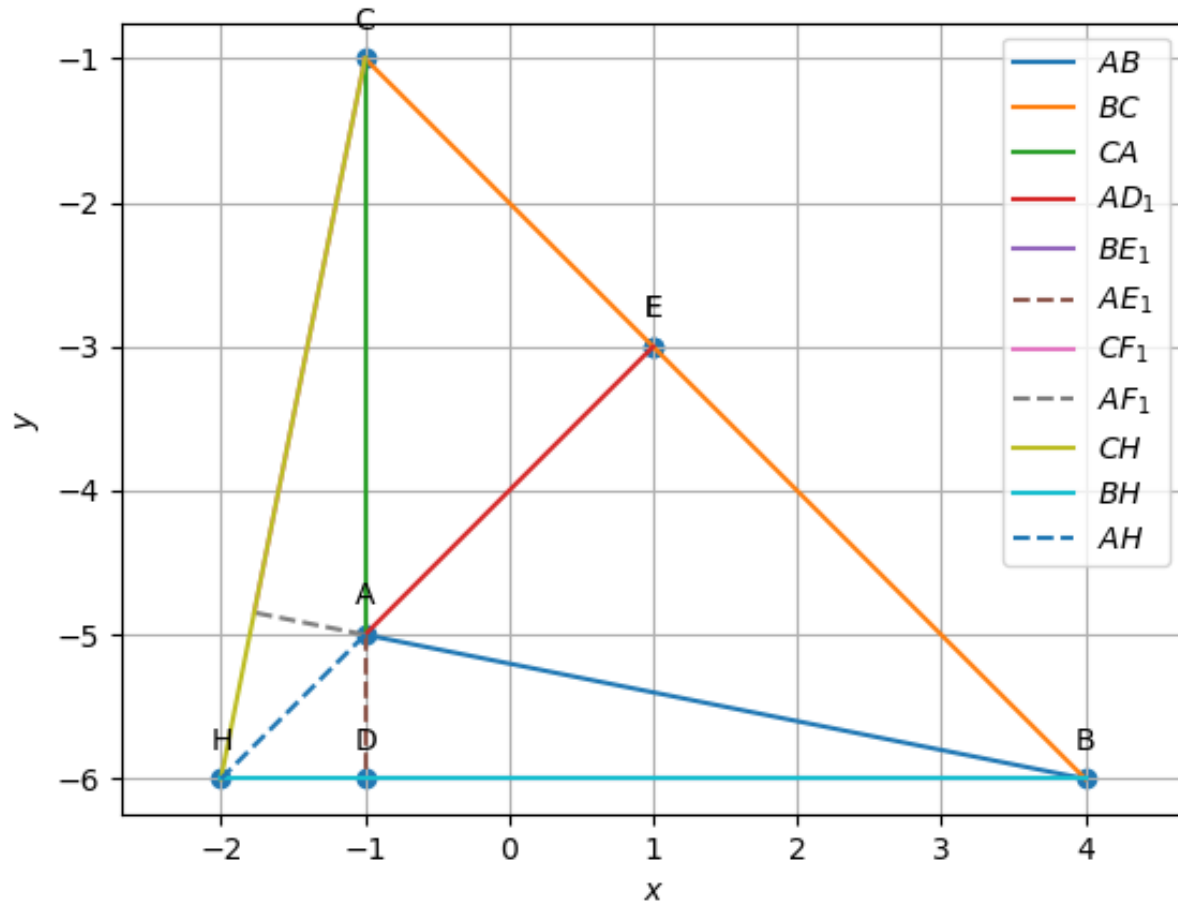


Fig. 0. Triangle ABC with altitudes AD_1 , BE_1 and CF_1

IV. PERPENDICULAR BISECTOR

Parameter	Value	Description
n^T	$\begin{pmatrix} -5 & 1 \end{pmatrix}$	OF (Perpendicular Bisector of AB)
c	-13	
n^T	$\begin{pmatrix} 5 & -5 \end{pmatrix}$	OD (Perpendicular Bisector of BC)
c	25	
n^T	$\begin{pmatrix} 0 & 4 \end{pmatrix}$	OE (Perpendicular Bisector of CA)
c	-12	
Circumcentre (O)	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	Point of intersection of OE and OF
Radius	3.6	Radius of circumcircle
Angle	202.6	BOC
Angle	101.3	BAC

TABLE 0

TABLE 4

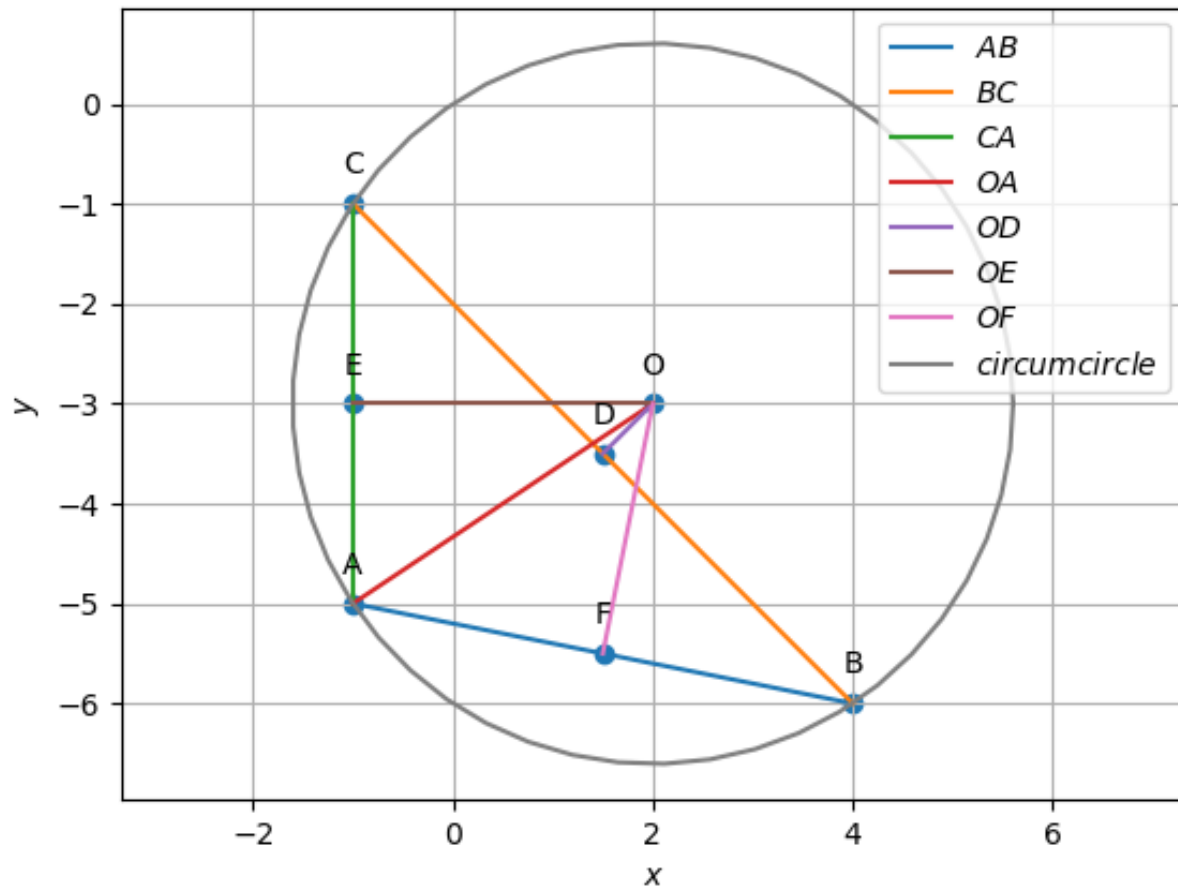


Fig. 0. circumcircle of triangle ABC with circumcentre O

V. ANGULAR BISECTOR

Parameter	Value	Description
n^T	$\begin{pmatrix} 0.8 & -0.98 \end{pmatrix}$	AI (Angle Bisector of A)
c	4.1	
n^T	$\begin{pmatrix} 0.9 & 1.69 \end{pmatrix}$	BI (Angle Bisector of B)
c	-6.51	
n^T	$\begin{pmatrix} -1.71 & -0.71 \end{pmatrix}$	CI (Angle Bisector of C)
c	5.24	
Incentre (I)	$\begin{pmatrix} 0.24 \\ -3.98 \end{pmatrix}$	Point of intersection of BI and CI
Distance	1.24	(I) from BC
Distance	1.24	(I) from AB
Distance	1.24	(I) from AC
Inradius	1.24	Radius of Incircle
D_3	$\begin{pmatrix} 1.11 \\ -3.11 \end{pmatrix}$	Point of contact of incircle with BC
E_3	$\begin{pmatrix} -0.005 \\ -5.19 \end{pmatrix}$	Point of contact of incircle with AB
F_3	$\begin{pmatrix} -1 \\ -3.98 \end{pmatrix}$	Point of contact of incircle with AC
m	1.01	Length of AE_3
n	4.08	Length of BD_3
p	2.99	Length of CD_3

TABLE 0

TABLE 5

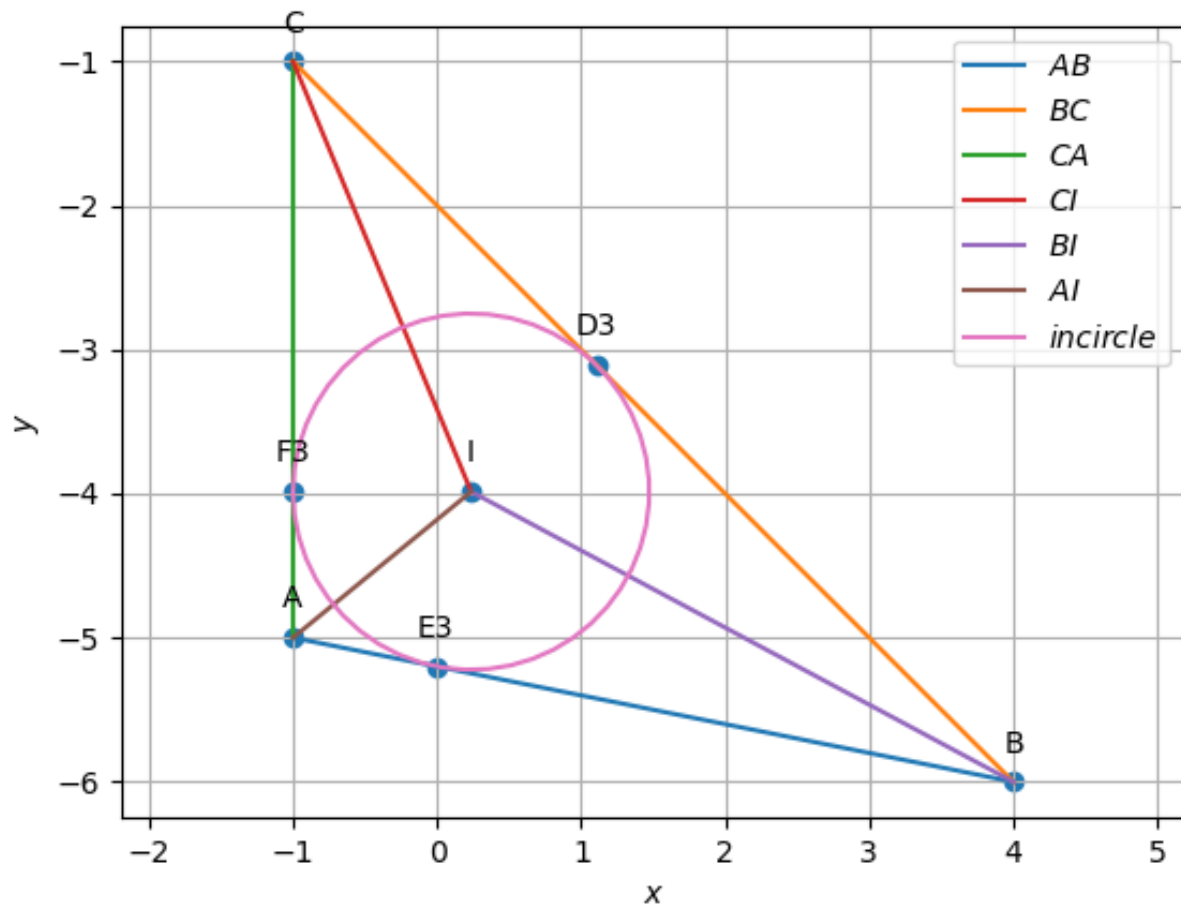


Fig. 0. incircle of triangle ABC with incentre I