Solution with figure

Aditya Vikram Singh*

Consider a triangle with vertices

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

$$\mathbf{B} = \begin{pmatrix} 4 \\ 5 \end{pmatrix} \tag{2}$$

$$\mathbf{C} = \begin{pmatrix} -1 \\ 4 \end{pmatrix} \tag{3}$$

parameter	value	description
$\mathbf{m_1}$	$\begin{pmatrix} 9 \\ 4 \end{pmatrix}$	AB
$\mathbf{m_2}$	$\begin{pmatrix} -5 \\ -1 \end{pmatrix}$	BC
$\mathbf{m_3}$	$\begin{pmatrix} -4 \\ -3 \end{pmatrix}$	AC
$\|\|B-A\|\|$	5.83	AB
$\|\|C-B\|\|$	6.40	BC
$\|\|A-C\|\|$	9.21	AC
rank	3	points are not collinear
$\mathbf{n_1}^\top$	$\begin{pmatrix} 4 & -9 \end{pmatrix}$	AB
c_1	-3	
$\mathbf{n_2}^\top$	$\begin{pmatrix} -1 & 5 \end{pmatrix}$	BC
c_2	5	
$\mathbf{n_3}^\top$	$\begin{pmatrix} -3 & 4 \end{pmatrix}$	AC
c_3	-39	
area	18.5	area of triangle
$\angle A$	12.90740°	Angle
$\angle B$	12.65255°	
$\angle C$	154.44003°	

TABLE 0
VECTORS

*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in.

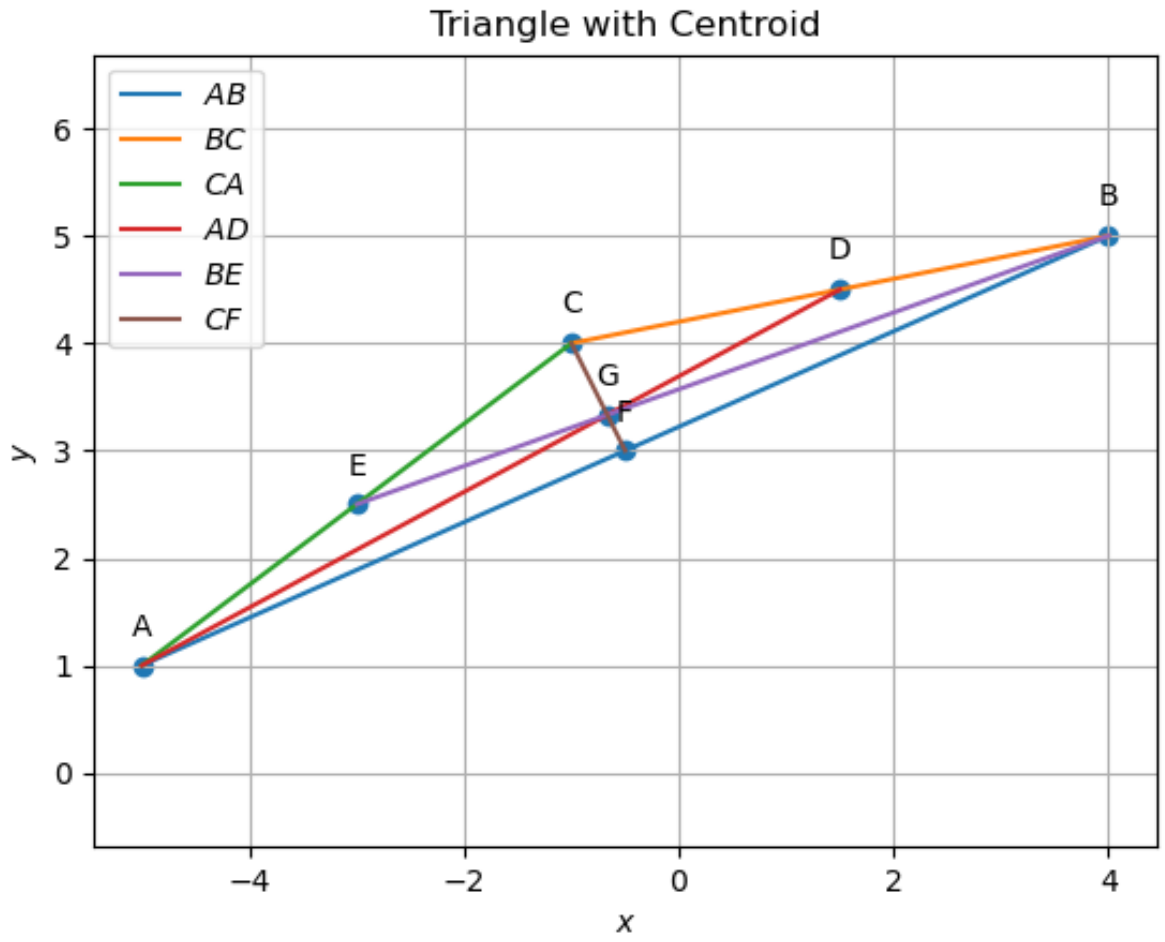

Fig. 0. Triangle

parameter	value	description
D	$\begin{pmatrix} 1.5 \\ -4.5 \end{pmatrix}$	midpoint of line BC
E	$\begin{pmatrix} -3 \\ -2.5 \end{pmatrix}$	midpoint of line AC
F	$\begin{pmatrix} -0.5 \\ 3 \end{pmatrix}$	midpoint of line AB
$\mathbf{n_4^\top}$	$\begin{pmatrix} 3.5 & -6.5 \end{pmatrix}$	AD
c_4	18	
$\mathbf{n_5^\top}$	$\begin{pmatrix} -2.5 & 7 \end{pmatrix}$	BE
c_5	4	
$\mathbf{n_6^\top}$	$\begin{pmatrix} -1 & -0.5 \end{pmatrix}$	CF
c_6	-22	
G	$\begin{pmatrix} -0.6666666666666675 \\ 3.33333333333 \end{pmatrix}$	centroid of triangle

TABLE 0
TRIANGLE WITH MIDPOINT

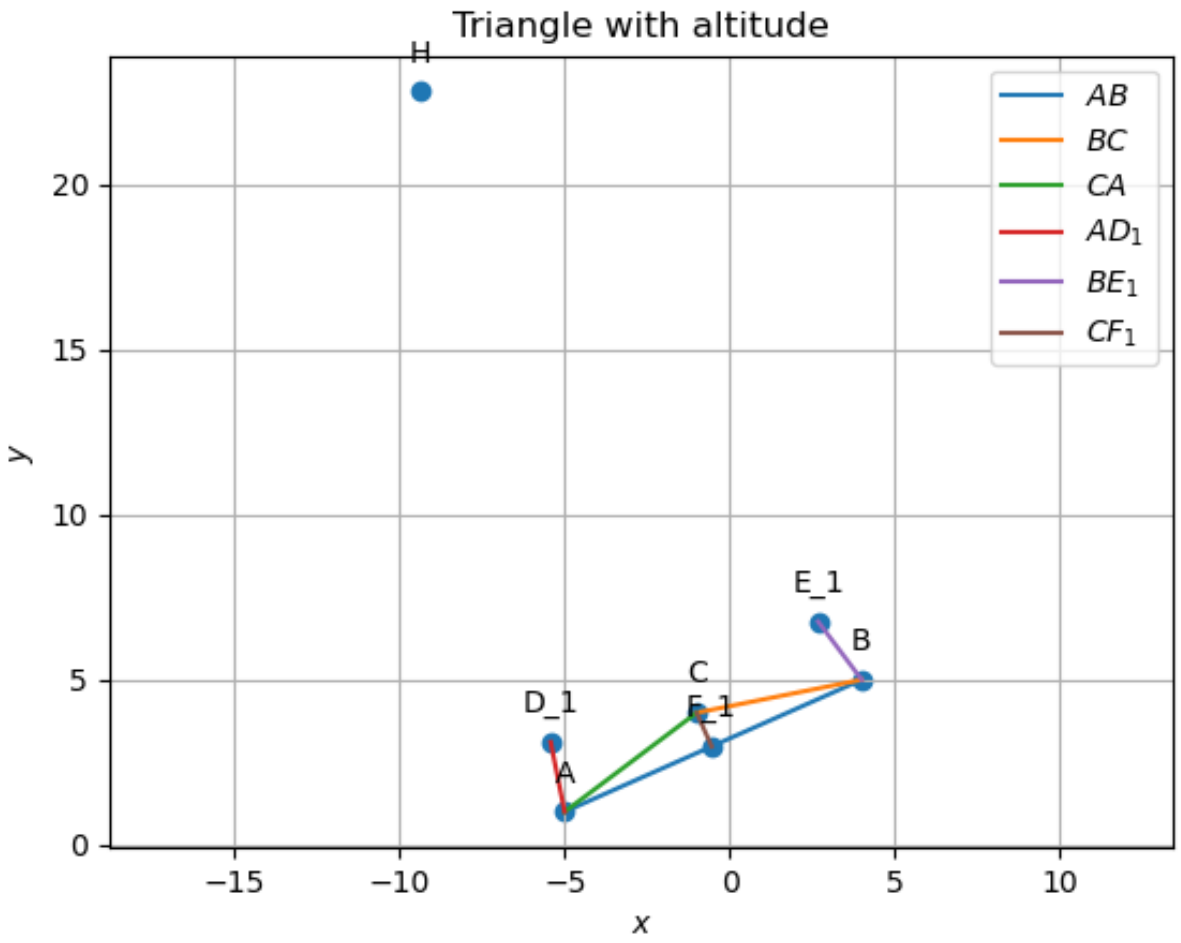

Fig. 0. Triangle

parameter	value	description
$\mathbf{n_7^\top}$	$\begin{pmatrix}-5 & -1\end{pmatrix}$	AD_1
c_7	-9	
$\mathbf{n_8^\top}$	$\begin{pmatrix}-4 & -3\end{pmatrix}$	BE_1
c_8	9	
$\mathbf{n_9^\top}$	$\begin{pmatrix}9 & 4\end{pmatrix}$	CF_1
c_9	0	
H	$\begin{pmatrix}-9.36\\22.81\end{pmatrix}$	orthocentre of triangle

TABLE 0
TRIANGLE WITH ORTHOCENTER

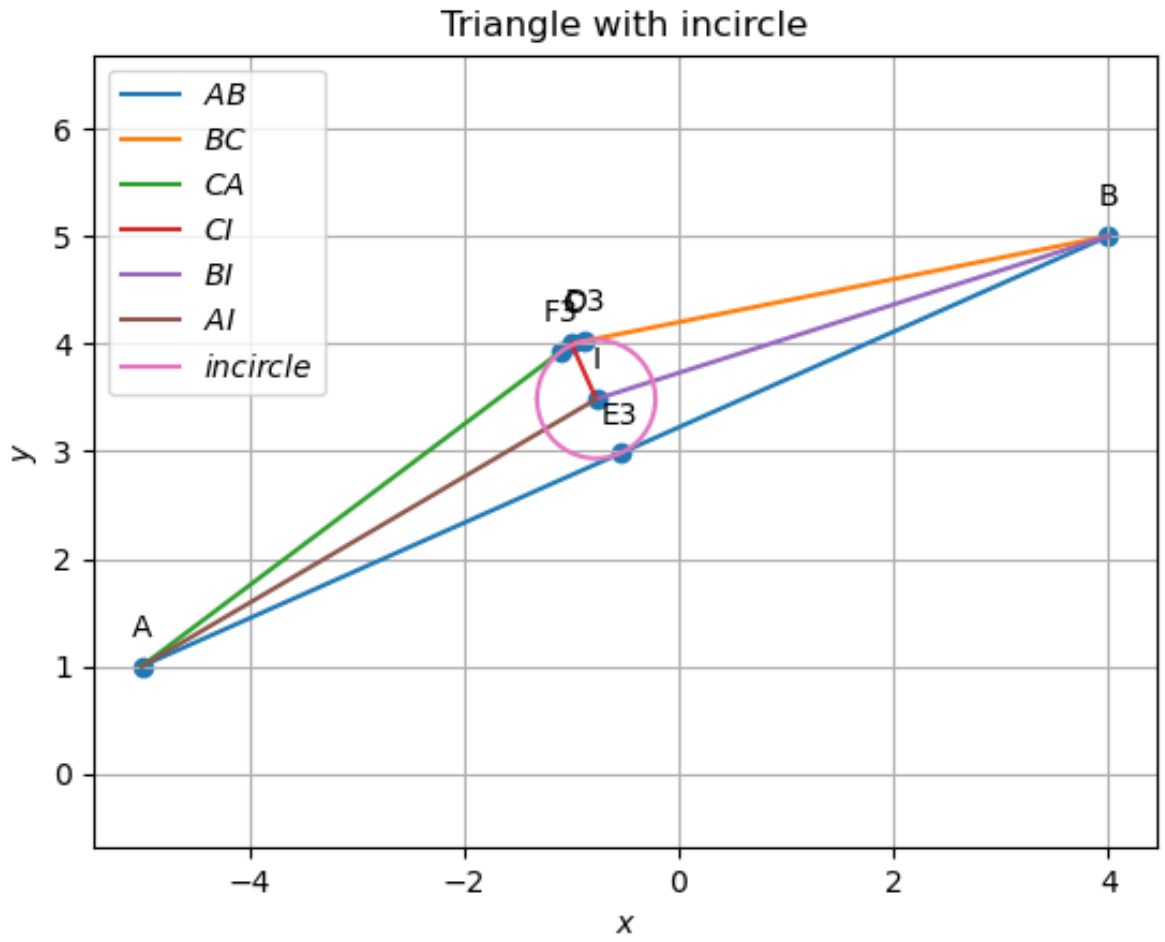

Fig. 0. Triangle

parameter	value	description
$\mathbf{n_{10}^\top}$	$\begin{pmatrix} 9 & 4 \end{pmatrix}$	Perpendicular bisector of AB
c_{10}	22	
$\mathbf{n_{11}^\top}$	$\begin{pmatrix} -5 & -1 \end{pmatrix}$	Perpendicular bisector of BC
c_{11}	-16.5	
$\mathbf{n_{12}^\top}$	$\begin{pmatrix} -4 & -3 \end{pmatrix}$	Perpendicular bisector of CA
c_{12}	-5.5	
$\mathbf{O}$	$\begin{pmatrix} 3.681 \\ -6.409 \end{pmatrix}$	Circumcircle
radius	4.65	

TABLE 0
TRIANGLE WITH CIRCUMCIRCLE

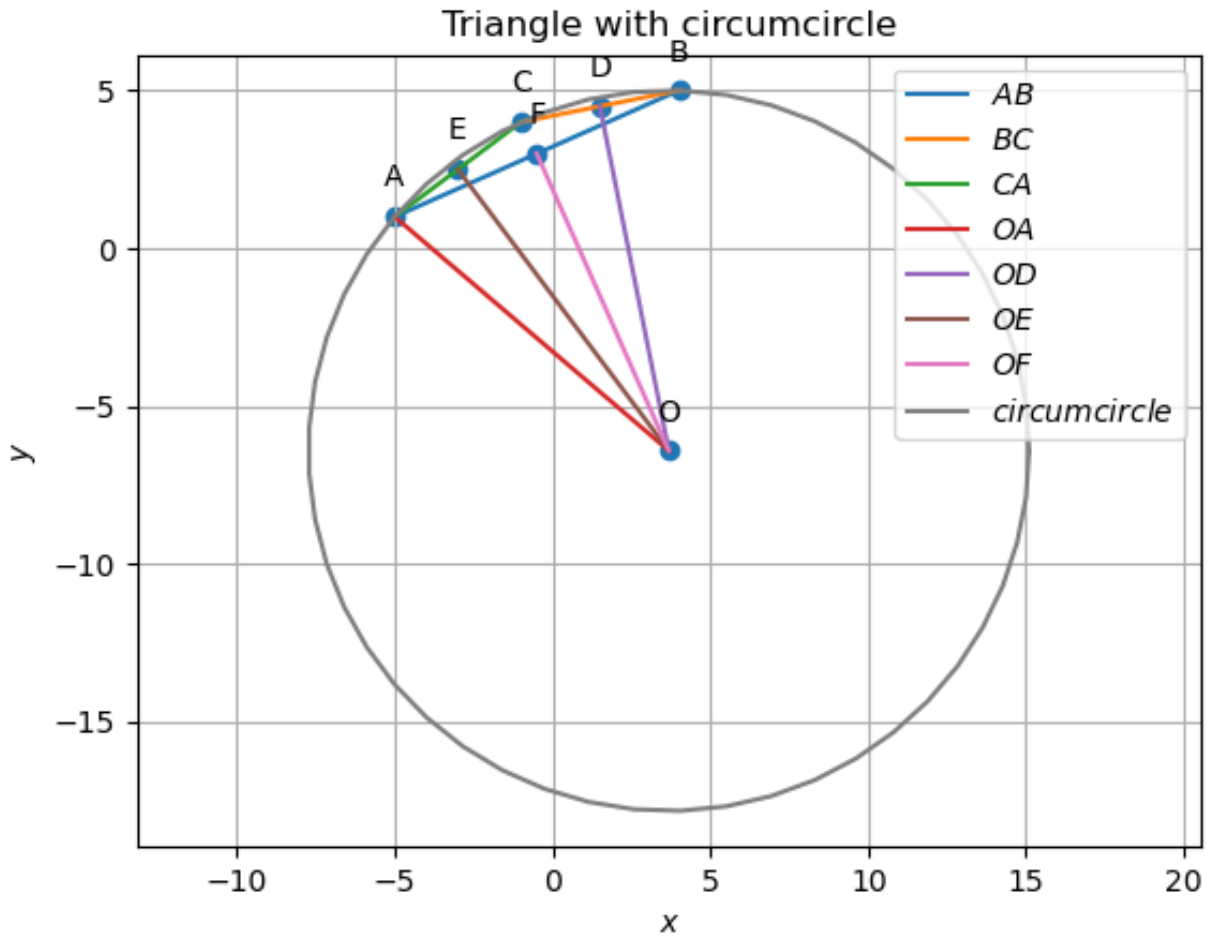

Fig. 0. Triangle