

Sample L^AT_EX Document with a Figure

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Consider a triangle with vertices,

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (1)$$

I. VECTORS

Parameter	Value	Description
\mathbf{m}_{AB}	$\begin{pmatrix} -7 \\ 5 \end{pmatrix}$	Direction vec of AB
\mathbf{m}_{BC}	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	Direction vec of BC
\mathbf{m}_{CA}	$\begin{pmatrix} 2 \\ -8 \end{pmatrix}$	Direction vec of CA
$ \mathbf{A} - \mathbf{B} $	5.831	Length of AB
$ \mathbf{B} - \mathbf{C} $	5.831	Length of BC
$ \mathbf{C} - \mathbf{A} $	5.831	Length of CA
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ A & B & C \end{pmatrix}$	3	non-collinear
\mathbf{n}_{AB}	$\begin{pmatrix} 5 \\ 7 \end{pmatrix}$	Normal vec of AB
\mathbf{n}_{BC}	$\begin{pmatrix} 3 \\ -5 \end{pmatrix}$	Normal vec of BC
\mathbf{n}_{CA}	$\begin{pmatrix} -8 \\ -2 \end{pmatrix}$	Normal vec of CA
Area	23	Area of $\triangle ABC$
$\cos(A)$	0.761	cosine of $\angle A$
$\cos(B)$	0.398	cosine of $\angle B$
$\cos(C)$	0.291	cosine of $\angle C$

TABLE I.1
VECTORS

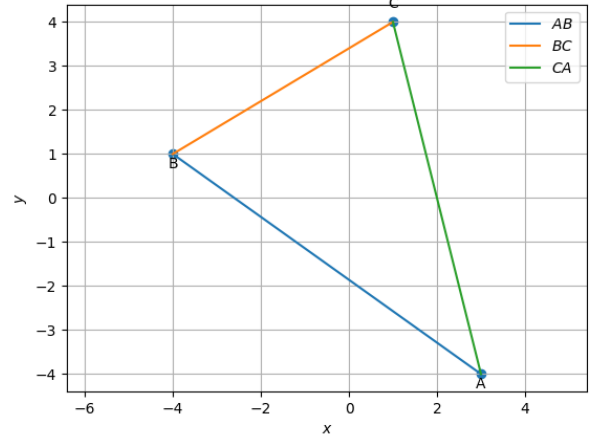


Fig. I.1. Triangle generated using python

II. MEDIAN

Parameter	Value	Description
\mathbf{D}	$\begin{pmatrix} -1.5 \\ 2.5 \end{pmatrix}$	Midpoint AB
\mathbf{E}	$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$	Midpoint BC
\mathbf{F}	$\begin{pmatrix} 0.5 \\ -1.5 \end{pmatrix}$	Midpoint CA
\mathbf{n}_{AD}	$\begin{pmatrix} 6.5 \\ 4.5 \end{pmatrix}$	normal vec AD
\mathbf{n}_{BE}	$\begin{pmatrix} -1 \\ -6 \end{pmatrix}$	normal vec BE
\mathbf{n}_{CF}	$\begin{pmatrix} -5.5 \\ 1.5 \end{pmatrix}$	normal vec CF
\mathbf{G}	$\begin{pmatrix} -0 \\ 0.333 \end{pmatrix}$	Centroid
$\frac{BG}{GE}$	2	Ratio of BG and GE
$\frac{CG}{GF}$		Ratio of CG and GF
$\frac{AG}{GF}$		Ratio of CG and GF
$\text{rank} \begin{pmatrix} 1 & 1 & 1 \\ A & D & G \end{pmatrix}$	2	$\mathbf{A}, \mathbf{D}, \mathbf{G}$ collinear
$\mathbf{A} - \mathbf{F}$	$\begin{pmatrix} 3.5 \\ -2.5 \end{pmatrix}$	Direction vec of AF
$\mathbf{E} - \mathbf{D}$		Direction vec of ED

TABLE II.2
CENTROID

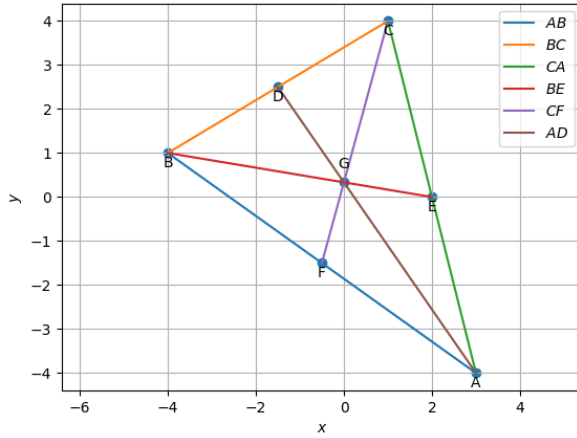


Fig. II.2. Medians generated using python

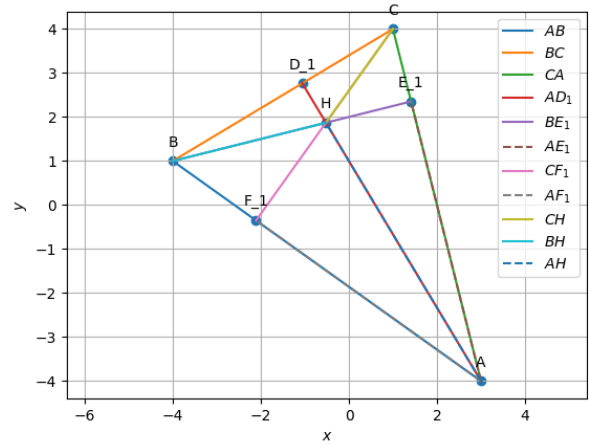


Fig. III.3. Altitudes generated using python

III. ALTITUDE

Parameter	Value	Description
D_1	$\begin{pmatrix} -1.059 \\ 2.764 \end{pmatrix}$	altitude foot from A
E_1	$\begin{pmatrix} 1.412 \\ 2.353 \end{pmatrix}$	altitude foot from B
F_1	$\begin{pmatrix} -2.108 \\ -0.351 \end{pmatrix}$	altitude foot from C
n_{AD_1}	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	normal vec AD_1
n_{BE_1}	$\begin{pmatrix} 2 \\ -8 \end{pmatrix}$	normal vec BE_1
n_{CF_1}	$\begin{pmatrix} -7 \\ 5 \end{pmatrix}$	normal vec CF_1
H	$\begin{pmatrix} -0.522 \\ 1.870 \end{pmatrix}$	Orthocenter

TABLE III.3
ORTHOCENTER

IV. PERPENDICULAR BISECTOR

n_{OA}	$\begin{pmatrix} -3.56 \\ -2.74 \end{pmatrix}$	Direction vec of OA
n_{OB}	$\begin{pmatrix} 1.43 \\ 4.26 \end{pmatrix}$	Direction vec of OB
n_{OC}	$\begin{pmatrix} 4.43 \\ -0.74 \end{pmatrix}$	Direction vec of OC
O	$\begin{pmatrix} 0.261 \\ -0.435 \end{pmatrix}$	Circumcenter
$ A - O $	4.496	Norm of OA
$ B - O $		Norm of OB
$ C - O $		Norm of OC
R		Circumradius
$\angle BAC$	40.42°	Angle $\angle BAC$
$\angle BOC$	80.85°	Angle $\angle BOC$

TABLE IV.4
CIRCUMCENTER

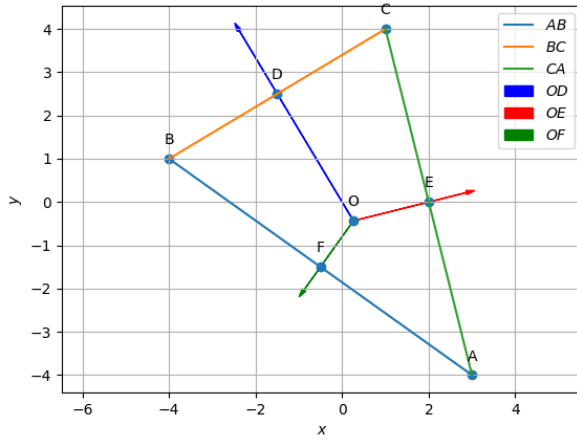


Fig. IV.4. Perpendicular bisectors generated using python

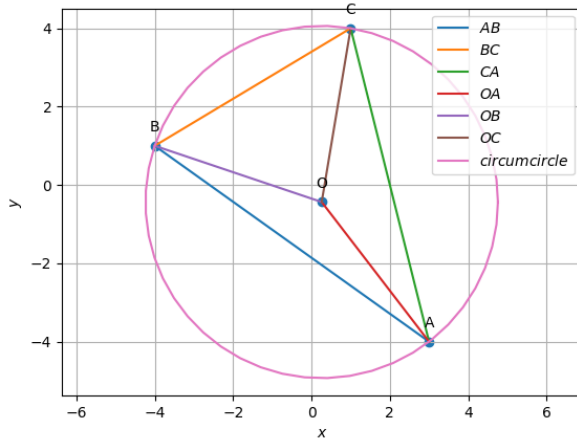


Fig. IV.4. Circumcircle generated using python

V. ANGULAR BISECTOR

\mathbf{n}_{IA}	$\begin{pmatrix} -4.85 \\ -3.30 \end{pmatrix}$	Direction vec of IA
\mathbf{n}_{IB}	$\begin{pmatrix} 0.15 \\ 3.70 \end{pmatrix}$	Direction vec of IB
\mathbf{n}_{IC}	$\begin{pmatrix} 3.15 \\ -1.30 \end{pmatrix}$	Direction vec of IC
\mathbf{I}	$\begin{pmatrix} -0.30 \\ 0.85 \end{pmatrix}$	Incenter
\mathbf{D}_3	$\begin{pmatrix} -1.35 \\ 2.59 \end{pmatrix}$	POC with AB
\mathbf{E}_3	$\begin{pmatrix} 1.66 \\ 1.34 \end{pmatrix}$	POC with BC
\mathbf{F}_3	$\begin{pmatrix} -1.48 \\ -0.80 \end{pmatrix}$	POC with CA
$ \mathbf{D}_3 - \mathbf{O} $	2.03	Norm of OD_3
$ \mathbf{E}_3 - \mathbf{O} $		Norm of OE_3
$ \mathbf{F}_3 - \mathbf{O} $		Norm of OF_3
\mathbf{r}		Inradius
$\angle BAI$	20.21°	Angle $\angle BAI$
$\angle CAI$		Angle $\angle CAI$

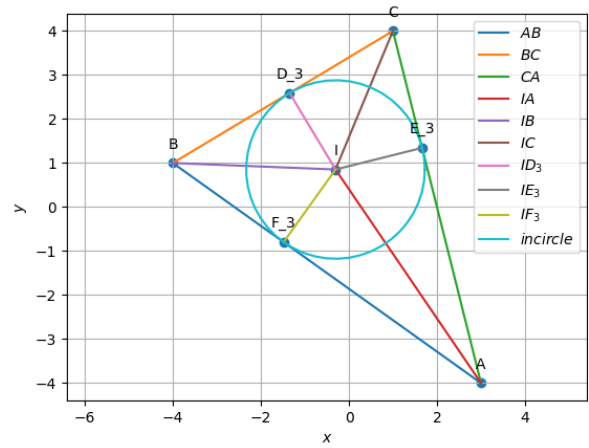
TABLE V.5
INCIRCLE

Fig. V.5. Incircle generated using python