

EE1390

MATRIX PROJECT

EE18BTECH11003 , EE18BTECH11013

Question-6

Q. The sides of a rhombus is parallel to the lines $(1 - 1)X + 2 = 0$, $(7 - 1)X + 3 = 0$. If the diagonals of a rhombus intersect at $P(1, 2)$ and the vertex C (different) from the origin is on the y -axis, then find the ordinate of C .

Solution

Given two lines are parallel to the sides of rhombus.

$$(1 -1)X+2=0$$

$$(7 -1)X+3=0$$

The intersection point of diagonal P is

$$P = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

where

$$X = \begin{pmatrix} x \\ y \end{pmatrix}$$

Let

$$A = \begin{pmatrix} 0 \\ a \end{pmatrix}$$

Now from above two equations let say slopes are m_1 and m_2 where $m_1=1$ and $m_2=7$

Now the angle between the given lines(sides of rhombus) containing diagonal other the diagonal containing C is

$$\tan\theta = (m_2 - m_1)/(1 + m_1 * m_2)$$

$$\tan\theta = (7 - 1)/(1 + 7)$$

$$\tan\theta = 3/4$$

$$\theta = 36.87 \text{ degree}$$

Now the angle between diagonal and one of those lines is

$$\theta/2 = 18.435 \text{ degree}$$

$$\text{and } \tan(\theta/2) = 0.33$$

$$\tan(\theta/2) = (1 - m)/(1 + m)$$

$0.33 = (1 - m)/(1 + m)$; m = slope of diagonal other than passing through A.

after solving the equation we get $m = 1/2$.

Now the slope of the other diagonal is $m=-2$.

(diagonals are perpendicular to each other).

The equation of other diagonal is which is passing through (1,2) and slope is -2 is given as
 $(2\ 1)X-4=0$.

After putting $X=C$ in above equation of diagonal we get

$$A = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$$

That is the ordinate of C is 4.

