

4.13.25

EE25BTECH11020 - Darsh Pankaj Gajare

September 29, 2025

Question:

Two sides of a rhombus are along the lines, $x - y + 1 = 0$ and $7x - y - 5 = 0$. If its diagonals intersect at $(-1, -2)$, then which one of the following is a vertex of this rhombus?

- (A) $(\frac{1}{3}, -\frac{8}{3})$ (B) $(-\frac{10}{3}, -\frac{7}{3})$ (C) $(-3, -9)$ (D) $(-3, -8)$

Solution:

Table

Line	Normal \mathbf{n}	Constant c
$\mathbf{n}_1^T \mathbf{x} = -1$	$\begin{pmatrix} 1 \\ -1 \end{pmatrix}$	-1
$\mathbf{n}_2^T \mathbf{x} = 5$	$\begin{pmatrix} 7 \\ -1 \end{pmatrix}$	5
Centre	$-$	$\mathbf{O} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$

$$A\mathbf{V}_A = b, \quad A = \begin{pmatrix} 1 & -1 \\ 7 & -1 \end{pmatrix}, \quad b = \begin{pmatrix} -1 \\ 5 \end{pmatrix} \quad (0.1)$$

$$\left(\begin{array}{cc|c} 1 & -1 & -1 \\ 7 & -1 & 5 \end{array} \right) \xrightarrow{R_2 - 7R_1} \left(\begin{array}{cc|c} 1 & -1 & -1 \\ 0 & 6 & 12 \end{array} \right) \quad (0.2)$$

$$\mathbf{V}_A = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad (0.3)$$

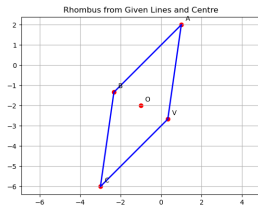
$$\mathbf{V}_C = 2\mathbf{O} - \mathbf{V}_A = 2 \begin{pmatrix} -1 \\ -2 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} -3 \\ -6 \end{pmatrix} \quad (0.4)$$

$$k = -\mathbf{n}_1^T \mathbf{V}_C = -3, \quad m = -\mathbf{n}_2^T \mathbf{V}_C = 15 \quad (0.5)$$

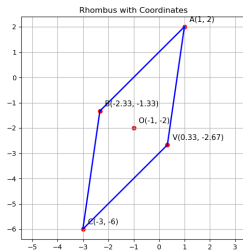
$$\left(\begin{array}{cc|c} 1 & -1 & 3 \\ 7 & -1 & 5 \end{array} \right) \xrightarrow{R_2 - 7R_1} \left(\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 6 & -16 \end{array} \right) \quad (0.6)$$

$$\mathbf{V} = \begin{pmatrix} \frac{1}{3} \\ \frac{8}{3} \end{pmatrix} \quad (0.7)$$

$$(0.8)$$



Plot using C libraries



Plot using Python