1-1.9-8

EE24BTECH11010 - BALAJI B

Question :

The distance between the points $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} a - b \\ a + b \end{pmatrix}$ is   (10, 2022)

Answer :

Variable	Value	Description
P	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$	First Endpoint
Q	$\begin{pmatrix} a - b \\ a + b \end{pmatrix}$	Second Endpoint

TABLE 0: Variables Used

$$\therefore \mathbf{P} - \mathbf{Q} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} - \begin{pmatrix} a - b \\ a + b \end{pmatrix} = \begin{pmatrix} b - a \\ -a - b \end{pmatrix} \tag{0.1}$$

$$(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q}) = \begin{pmatrix} b - a & -a - b \end{pmatrix} \begin{pmatrix} b - a \\ -a - b \end{pmatrix} \tag{0.2}$$

$$(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q}) = (b - a)^2 + (a + b)^2 \tag{0.3}$$

Thus the desired distance is

$$d = \|P - Q\| = \sqrt{(b - a)^2 + (a + b)^2} \tag{0.4}$$