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Matrix 1.11.2

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Question

Find the unit vector along PQ , where $\mathbf{P} = (2, 1, -1)$ and $\mathbf{Q} = (4, 4, -7)$.

Solution

Step 1: Vector PQ

The given points are

$$\mathbf{P} = \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}, \quad \mathbf{Q} = \begin{pmatrix} 4 \\ 4 \\ -7 \end{pmatrix}.$$

Hence,

$$PQ = \mathbf{Q} - \mathbf{P} = \begin{pmatrix} 4 \\ 4 \\ -7 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \\ -6 \end{pmatrix}. \quad (1)$$

Step 2: Magnitude of PQ

$$\|PQ\| = \sqrt{2^2 + 3^2 + (-6)^2} = \sqrt{4 + 9 + 36} = \sqrt{49} = 7. \quad (2)$$

Step 3: Unit vector along PQ

The unit vector is

$$\mathbf{OA} = \frac{PQ}{\|PQ\|} = \frac{1}{7} \begin{pmatrix} 2 \\ 3 \\ -6 \end{pmatrix}. \quad (3)$$

Final Answer

$$\boxed{\mathbf{OA} = \frac{1}{7} \begin{pmatrix} 2 \\ 3 \\ -6 \end{pmatrix}}$$

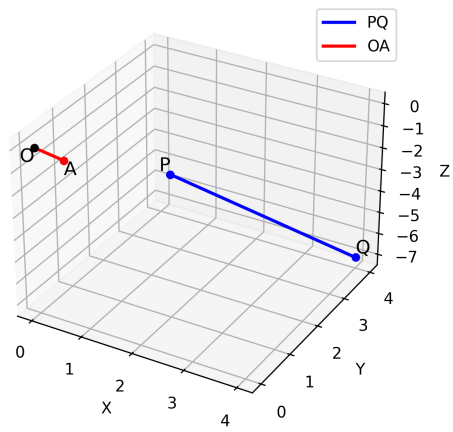


Figure 1: Unit vector \mathbf{OA} along PQ