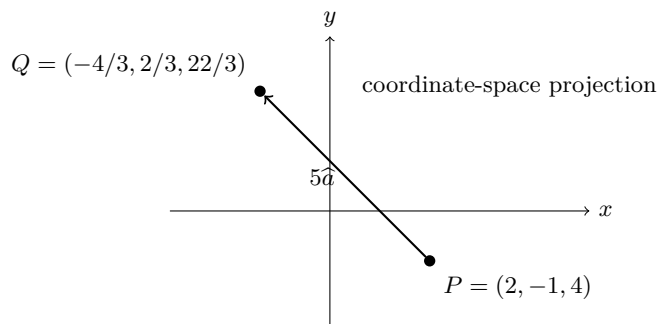


Question 4

The point $P = (2, -1, 4)$ is translated five units in the direction of $\vec{a} = \langle -2, 1, 2 \rangle$. Find the image point Q .

Question 4 – Solution

Strategy Identify the initial and terminal information first. Build the vector by subtracting coordinates, then use the magnitude formula or normalize only after the components are correct.



Step 1 First normalize: $\|\vec{a}\| = 3$, so $\hat{a} = \frac{1}{3}\langle -2, 1, 2 \rangle$.

Step 2 A five-unit translation has vector $5\hat{a} = \langle -10/3, 5/3, 10/3 \rangle$.

Step 3 Add it to P : $Q = P + 5\hat{a} = \left(-\frac{4}{3}, \frac{2}{3}, \frac{22}{3} \right)$.

Verification The result follows from the defining vector formulas used above, and each component, magnitude, or scalar condition has been checked against the information in the question.

Key idea A vector separates two ideas: its components describe displacement, while its magnitude and unit vector describe size and direction. Always check signs and confirm that a unit vector has magnitude 1.