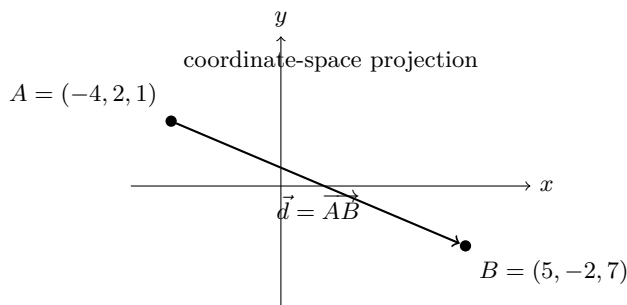


Question 1

A rescue drone travels from $A = (-4, 2, 1)$ to $B = (5, -2, 7)$. Find the displacement vector, its magnitude, and the corresponding unit direction vector.

Question 1 – 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 Subtract initial coordinates from terminal coordinates: $\vec{d} = B - A = \langle 9, -4, 6 \rangle$.

Step 2 Compute its length: $\|\vec{d}\| = \sqrt{9^2 + (-4)^2 + 6^2} = \sqrt{133}$.

Step 3 Normalize: $\hat{d} = \vec{d}/\|\vec{d}\| = \frac{1}{\sqrt{133}} \langle 9, -4, 6 \rangle$. The displacement magnitude is $\sqrt{133}$.

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.