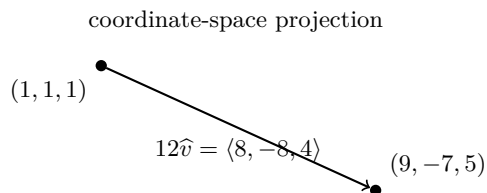


Question 7

A particle moves from $(1, 1, 1)$ in the direction $\langle 2, -2, 1 \rangle$. At what point has it traveled exactly 12 units?

Question 7 – 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 The direction magnitude is $\sqrt{4 + 4 + 1} = 3$, so its unit vector is $\frac{1}{3}\langle 2, -2, 1 \rangle$.

Step 2 A 12-unit displacement is $12\hat{v} = \langle 8, -8, 4 \rangle$.

Step 3 Adding the starting point gives $(9, -7, 5)$.

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.