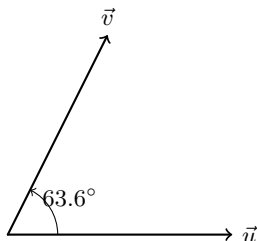


Question 1

Find the angle between $\vec{u} = \langle 1, 2, 2 \rangle$ and $\vec{v} = \langle 2, -1, 2 \rangle$.

Question 1 – Solution

Strategy Compute the dot product carefully, then choose the formula that matches the question. A zero, positive, or negative dot product also gives immediate geometric information.



Step 1 Compute $\vec{u} \cdot \vec{v} = 2 - 2 + 4 = 4$.

Step 2 Both magnitudes are 3, so $\cos \theta = 4/(3 \cdot 3) = 4/9$.

Step 3 Therefore $\theta = \cos^{-1}(4/9) \approx 63.6^\circ$.

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 The dot product converts two vectors into a scalar measuring directional agreement: positive means generally aligned, zero means perpendicular, and negative means generally opposed.