

(1) $\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$ and $\vec{b} = b_1\vec{i} + b_2\vec{j} + b_3\vec{k}$ are two vectors in 3D space. Their dot product is given by $\vec{a} \cdot \vec{b} = a_1b_1 + a_2b_2 + a_3b_3$.

(2) The magnitude of a vector $\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$ is given by $|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$. The direction cosines are $\cos \alpha = \frac{a_1}{|\vec{a}|}$, $\cos \beta = \frac{a_2}{|\vec{a}|}$, and $\cos \gamma = \frac{a_3}{|\vec{a}|}$, where α, β, γ are the angles the vector makes with the x, y, and z axes respectively.

10-10

10-10 The dot product of two vectors \vec{a} and \vec{b} is given by $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}|\cos \theta$, where θ is the angle between them. For example, if $\vec{a} = 3\vec{i} + 4\vec{j}$ and $\vec{b} = 4\vec{i} + 3\vec{j}$, then $\vec{a} \cdot \vec{b} = 3 \cdot 4 + 4 \cdot 3 = 24$.