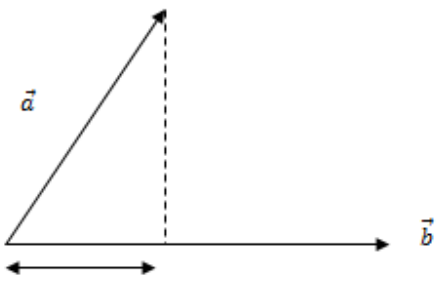




1. If $\vec{a} = 7\hat{i} + \hat{j} - 4\hat{k}$ and $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$ then find the projection of \vec{a} on \vec{b}

Answer:

<p>We know that projection of \vec{a} on \vec{b} means component of \vec{a} along the direction of \vec{b}</p>  <p style="text-align: center;">$a \cos \theta = \text{Project of } \vec{a} \text{ on } \vec{b}$</p>	<p>We know $\vec{a} \cdot \vec{b} = ab \cos \theta$ Or $\frac{\vec{a} \cdot \vec{b}}{b} = a \cos \theta$ Or $\frac{(7\hat{i} + \hat{j} - 4\hat{k}) \cdot (2\hat{i} + 6\hat{j} + 3\hat{k})}{b} = a \cos \theta$ Or $\frac{14 + 6 - 12}{\sqrt{4 + 36 + 9}} = a \cos \theta$ Or $\frac{8}{7} = a \cos \theta$</p> <p>Therefore Projection of \vec{a} on $\vec{b} = \frac{8}{7}$</p>
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2. Find λ , if the vectors $\vec{a} = \hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{c} = \lambda\hat{j} + 3\hat{k}$ are coplanar

<p>We know that if the vectors are coplanar then the volume of the parallelepiped formed by 3 vectors will be zero.</p> <p>Therefore for coplanar vector \vec{a}. $(\vec{b} \times \vec{c}) = 0$</p> $\begin{vmatrix} 1 & 3 & 1 \\ 2 & -1 & -1 \\ 0 & \lambda & 3 \end{vmatrix} = 0$	<p>Or $1(-3 + \lambda) - 3(6 - 0) + 1(2\lambda - 0) = 0$ Or $-3 - 18 + 3\lambda = 0$ Or $\lambda = \frac{21}{3} = 7$</p> <p>Answer $\lambda = 7$</p>
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3. If the line makes angles 90° , 60° and θ with x,y and z-axis respectively, where θ is acute then find θ

<p>We know that if a vector makes α, β and γ angle with X, Y and Z axis then</p> $\cos\alpha = \frac{a_x}{\sqrt{a_x^2 + a_y^2 + a_z^2}}$ $\cos\beta = \frac{a_y}{\sqrt{a_x^2 + a_y^2 + a_z^2}}$ $\cos\gamma = \frac{a_z}{\sqrt{a_x^2 + a_y^2 + a_z^2}}$ <p>Therefore from above equation we have</p> $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$	<p>Given $\alpha = 90^\circ, \beta = 60^\circ$ and $\gamma = \theta (< 90^\circ)$</p> <p>Therefore</p> $\cos^2 90 + \cos^2 60 + \cos^2 \theta = 1$ <p>Or $0 + \frac{1}{4} + \cos^2 \theta = 1$</p> <p>Or $\cos^2 \theta = 1 - \frac{1}{4} = \frac{3}{4}$</p> <p>Or $\cos \theta = \pm \frac{\sqrt{3}}{2}$ Since θ is acute</p> $\cos \theta = + \frac{\sqrt{3}}{2}$ <p>$\theta = 30^\circ$</p> <p>Answer: $\theta = 30^\circ$</p>
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4. Write the element a_{23} of a 3 X 3 matrix $A = (a_{ij})$ whose elements a_{ij} are given by $a_{ij} = \frac{|i-j|}{2}$

Answer: Given $a_{ij} = \frac{|i-j|}{2}$

Therefore $a_{23} = \frac{|2-3|}{2} = \frac{1}{2}$