

$$v_1 = v_x(5) + v_y(2) + v_z(1)$$

$$\vec{v}_2 = \vec{v}_x(3) + \vec{v}_y(1) + \vec{v}_z(7)$$

$$\begin{array}{c} \rightarrow \\ \downarrow \\ \text{V}_2 \end{array} = \begin{array}{c} \rightarrow \\ \downarrow \\ \text{V}_2 \end{array} \left(\begin{array}{c} \rightarrow \\ \downarrow \\ \text{V}_2 \end{array} \right) + \begin{array}{c} \rightarrow \\ \downarrow \\ \text{V}_2 \end{array} \left(\begin{array}{c} \rightarrow \\ \downarrow \\ \text{V}_2 \end{array} \right)$$





$$\vec{V}_1 = \vec{u}_x(5) + \vec{u}_y(-2) + \vec{u}_z(1), \quad \vec{V}_2 = \vec{u}_x(-3) + \vec{u}_y(1) + \vec{u}_z(-7), \quad \vec{V}_3 = \vec{u}_x(4) + \vec{u}_y(7) + \vec{u}_z(6).$$

$$\vec{R} = \vec{v}_1 + \vec{v}_2 + \vec{v}_3.$$

$$\vec{R} = (5 - 3 + 4)\vec{u}_x + (-2 + 1 + 7)\vec{u}_y + (1 - 7 + 6)\vec{u}_z = 6\vec{u}_x + 6\vec{u}_y + 0\vec{u}_z.$$



$$||\vec{R}|| = \sqrt{6^2 + 6^2 + 0^2} = \sqrt{72} = 6\sqrt{2}.$$







$$\cos(\alpha) = \frac{R_x}{\|\vec{R}\|}, \quad \cos(\beta) = \frac{R_y}{\|\vec{R}\|}, \quad \cos(\gamma) = \frac{R_z}{\|\vec{R}\|}.$$

$$\cos(\alpha) = \frac{6}{6\sqrt{2}} = \frac{1}{\sqrt{2}}, \quad \cos(\beta) = \frac{6}{6\sqrt{2}} = \frac{1}{\sqrt{2}}, \quad \cos(\gamma) = \frac{0}{6\sqrt{2}} = 0.$$

$$\alpha = \frac{\pi}{4}, \quad \beta = \frac{\pi}{4}, \quad \gamma = \frac{\pi}{2}.$$

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$$\vec{V} = vx(1) - vx(2) + vx(3)$$

















$$d(P,\ell)=\frac{\left\| (P-Q)\times \vec{v}\right\| }{\left\| \vec{v}\right\| }.$$

$$P-Q = (4+3, 5-6, -7-12) = (7, -1, -19).$$

$$(P - Q) \times \vec{V} = \begin{vmatrix} \vec{u}_x & \vec{u}_y & \vec{u}_z \\ 7 & -1 & -19 \\ 4 & -1 & 3 \end{vmatrix} = (-22, -97, -3).$$

$$|| (P-Q) \times \vec{v} || = \sqrt{(-22)^2 + (-97)^2 + (-3)^2} = \sqrt{9902}, \quad || \vec{v} || = \sqrt{4^2 + (-1)^2 + 3^2} = \sqrt{26}.$$



$$d(P, \ell) = \frac{\sqrt{9902}}{\sqrt{26}} = \sqrt{381}.$$









$$d(P, \mathcal{P}) = \frac{|(P - Q) \cdot \vec{v}|}{\|\vec{v}\|}.$$

$$(P-Q) \cdot \vec{v} = (7, -1, -19) \cdot (4, -1, 3) = 28 + 1 - 57 = -28.$$

$$d(P, \mathcal{P}) = \frac{|-28|}{\sqrt{26}} = \frac{28}{\sqrt{26}}.$$



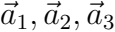
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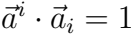
$\sqrt{20}$



$$\vec{a}^1 = \frac{\vec{a}_2 \times \vec{a}_3}{\vec{a}_1 \cdot \vec{a}_2 \times \vec{a}_3},$$

$$\vec{a}^2 = \frac{\vec{a}_3 \times \vec{a}_1}{\vec{a}_1 \cdot \vec{a}_2 \times \vec{a}_3},$$

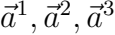
$$\vec{a}^3 = \frac{\vec{a}_1 \times \vec{a}_2}{\vec{a}_1 \cdot \vec{a}_2 \times \vec{a}_3}$$



















$$\vec{a}^1 \cdot \vec{a}_1 = \frac{(\vec{a}_2 \times \vec{a}_3) \cdot \vec{a}_1}{\vec{a}_1 \cdot (\vec{a}_2 \times \vec{a}_3)}$$

$$\vec{a}^1 \cdot \vec{a}_1 = \frac{\vec{a}_1 \cdot (\vec{a}_2 \times \vec{a}_3)}{\vec{a}_1 \cdot (a_2 \times \vec{a}_3)}.$$

$$\vec{\sigma}_1 \cdot \vec{\sigma}_1 = 1$$

$$\vec{a}^2 \cdot \vec{a}_2 = 1, \quad \vec{a}^3 \cdot \vec{a}_3 = 1.$$



$$\vec{a}^1 \cdot \vec{a}_2 = \frac{(\vec{a}_2 \times \vec{a}_3) \cdot \vec{a}_2}{\vec{a}_1 \cdot (\vec{a}_2 \times \vec{a}_3)}.$$





$$(\vec{a}_2 \times \vec{a}_3) \cdot \vec{a}_2 = 0.$$

$$\vec{\sigma}_1 \cdot \vec{\sigma}_2 = 0.$$

$$\vec{a}^1 \cdot \vec{a}_3 = 0, \quad \vec{a}^2 \cdot \vec{a}_1 = 0 \quad \vec{a}^2 \cdot \vec{a}_3 = 0 \quad \vec{a}^3 \cdot \vec{a}_1 = 0 \quad \vec{a}^3 \cdot \vec{a}_2 = 0.$$