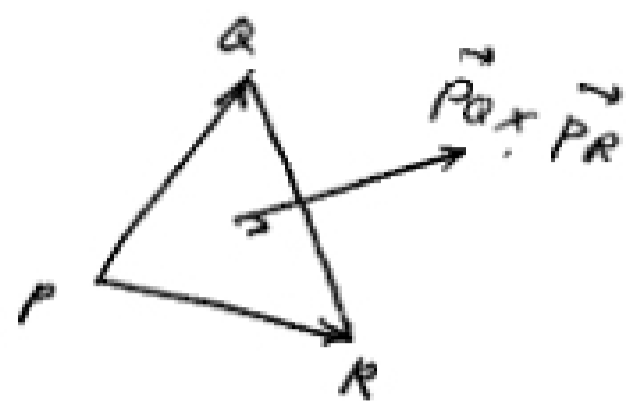


30/
④

$P(0, 0, -3)$, $Q(4, 2, 0)$, $R(3, 3, 1)$

(a) $\vec{PQ} \times \vec{PR}$ orthogonal to the plane through P, Q, R :

$$\boxed{\vec{PQ} \times \vec{PR}} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 4 & 2 & 3 \\ 3 & 3 & 4 \end{vmatrix} = \langle -1, -7, 6 \rangle$$



(b) $S_{\Delta PQR} = \frac{1}{2} |\vec{PQ} \times \vec{PR}| = \frac{1}{2} \sqrt{(-1)^2 + (-7)^2 + 6^2} = \frac{1}{2} \sqrt{86}$

37/
②

$\vec{u} = \vec{i} + 5\vec{j} - 2\vec{k}$, $\vec{v} = 3\vec{i} - \vec{j}$, $\vec{w} = 5\vec{i} + 9\vec{j} - 4\vec{k}$

$$\boxed{\vec{u} \cdot (\vec{v} \times \vec{w})} = \langle 1, 5, -2 \rangle \cdot \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & -1 & 0 \\ 5 & 9 & -4 \end{vmatrix}$$

$$= \langle 1, 5, -2 \rangle \cdot \langle 4, 12, 32 \rangle$$

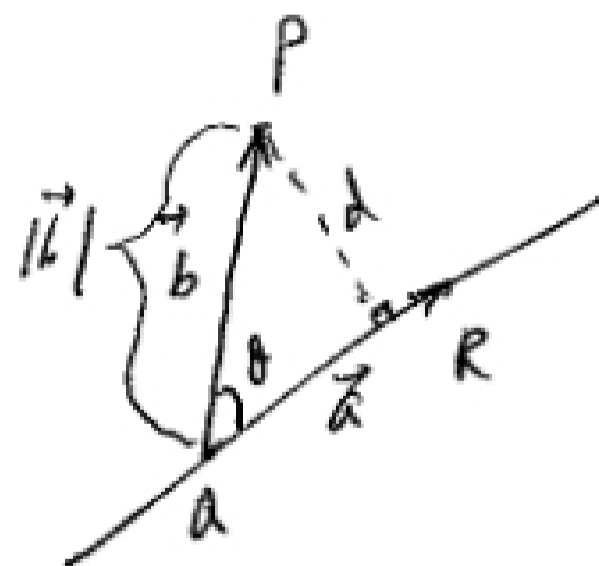
$$= 4 + 60 - 64 = 0$$

So $\vec{u}, \vec{v}, \vec{w}$ coplanar.

45/
②

(a) The distance from the point P to the line is:

$$\boxed{\begin{aligned} d &= |\vec{b}| \sin \theta \\ &= \frac{|\vec{a}| |\vec{b}| \sin \theta}{|\vec{a}|} \\ &= \frac{|\vec{a} \times \vec{b}|}{|\vec{a}|} \end{aligned}}$$

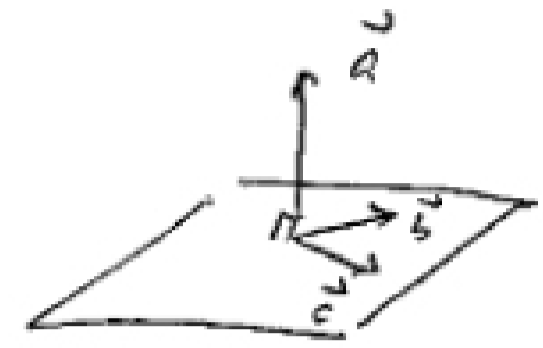


53/ $\vec{a} \neq \vec{0}$

(a) $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} \Rightarrow \vec{a} \cdot (\vec{b} - \vec{c}) = 0$

$\Rightarrow \vec{a} \perp (\vec{b} - \vec{c})$

but \vec{b} may not equal to \vec{c} .

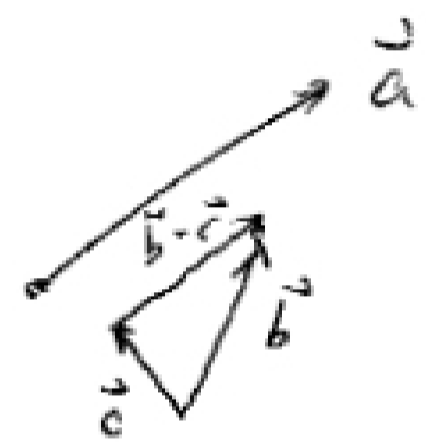


Ans: No.

(b) $\vec{a} \times \vec{b} = \vec{a} \times \vec{c} \Rightarrow \vec{a} \times (\vec{b} - \vec{c}) = \vec{0}$

$\Rightarrow \vec{a} \parallel (\vec{b} - \vec{c})$

Again, \vec{b} may not equal to \vec{c}



Ans: No.

(c) $\left. \begin{array}{l} \vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} \\ \vec{a} \times \vec{b} = \vec{a} \times \vec{c} \end{array} \right\} \Rightarrow \vec{a} \perp (\vec{b} - \vec{c}) \text{ and } \vec{a} \parallel (\vec{b} - \vec{c})$

$\vec{a} \neq \vec{0}$ So $\vec{b} - \vec{c} = \vec{0} \Rightarrow \vec{b} = \vec{c}$

Ans. Yes.

§ 10.5

1/.

(a) True

(b) False: A right-angled triangle with vertices labeled 1, 2, and 3. The right angle is at vertex 2.

(c) True

(d) False: A 3D diagram of a rectangular prism with vertices labeled 1, 2, and 3.

(e) False

(f) True: A 3D diagram of a rectangular prism with vertices labeled 1, 2, and 3.

(g) False: A 3D diagram of a rectangular prism with vertices labeled 1, 2, and 3.

(h) True

(i) True

(j) False: A 2D diagram of a quadrilateral with vertices labeled 1, 2, and 3. The quadrilateral is skewed.

(k) True