

$$\vec{v} (4,-1,2) \quad , \quad \vec{u} (2,-3,5) \quad (1)$$

$$\begin{aligned} \vec{u} \wedge \vec{v} &= \begin{vmatrix} -3 & -1 \\ 5 & 2 \end{vmatrix} \vec{i} - \begin{vmatrix} 2 & 4 \\ 5 & 2 \end{vmatrix} \vec{j} + \begin{vmatrix} 2 & 4 \\ -3 & -1 \end{vmatrix} \vec{k} \\ &= (-6 + 5) \vec{i} - (4 - 20) \vec{j} + (-2 + 12) \vec{k} \\ \vec{u} \wedge \vec{v} &= - \vec{i} + 16 \vec{j} + 10 \vec{k} \end{aligned} \quad \text{إذن}$$

$$\vec{v} (2,3,2) \quad , \quad \vec{u} (3,2,3) \quad (2)$$

$$\begin{aligned} \vec{u} \wedge \vec{v} &= \begin{vmatrix} 2 & 3 \\ 3 & 2 \end{vmatrix} \vec{i} - \begin{vmatrix} 3 & 2 \\ 3 & 2 \end{vmatrix} \vec{j} + \begin{vmatrix} 3 & 2 \\ 2 & 3 \end{vmatrix} \vec{k} \\ &= - 5 \vec{i} + 5 \vec{k} \end{aligned}$$

$$\vec{v} (3,2,0) \quad , \quad \vec{u} (2,3,0) \quad (3)$$

$$\begin{aligned} \vec{u} \wedge \vec{v} &= \begin{vmatrix} 3 & 2 \\ 0 & 0 \end{vmatrix} \vec{i} - \begin{vmatrix} 2 & 3 \\ 0 & 0 \end{vmatrix} \vec{j} + \begin{vmatrix} 2 & 3 \\ 3 & 2 \end{vmatrix} \vec{k} \\ &= - 5 \vec{k} \end{aligned}$$

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