Cross Product

The vector which is perpendicular to both vector a and vector b, the sides of a parallelogram is the cross product, is the cross product of a and b $(a \times b)$

$$a \times b = ||a|| \, ||b|| \sin \theta \, n$$

θ is the angle between a and b, and n is the **unit vector** perpendicular to the plane containing a and b.

$$
a \times b = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ u_1 & u_2 & u_3 \\ v_1 & v_2 & v_3 \end{vmatrix}
$$

$$
= \begin{bmatrix} u_2 & u_3 \\ v_2 & v_3 \end{bmatrix} \mathbf{i} - \begin{bmatrix} u_1 & u_3 \\ v_1 & v_3 \end{bmatrix} \mathbf{j} + \begin{bmatrix} u_1 & u_2 \\ v_1 & v_2 \end{bmatrix} \mathbf{k}
$$

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