

The Cross Product of Vectors in \mathbb{R}^3 - HW Problems

1. Let $\vec{v} = 2\vec{i} - \vec{j} + 3\vec{k}$ and $\vec{w} = -3\vec{i} + \vec{j} - 2\vec{k}$. Find $\vec{v} \times \vec{w}$.
2. The vertices of a triangle are given by $A(0,0,0)$, $B(2, -1, 3)$, and $C(-3, 1, -2)$. Find the area of this triangle using the cross product.
3. Let $\vec{v} = \vec{i} + 3\vec{j} - 2\vec{k}$ and $\vec{w} = -2\vec{i} + \vec{j} - 3\vec{k}$. Find all unit vectors that are perpendicular to both \vec{v} and \vec{w} .
4. Find a vector perpendicular to the plane that contains the points $A(-2, 0, 1)$, $B(1, 3, 0)$, and $C(-1, -1, 2)$.
5. Find an equation of a plane that passes through the points in problem 4.
6. An equation of plane P is given by $x - 2y + 3z = 6$. Determine if the following points are in the plane P .
 - a. $(-4, -4, 2)$
 - b. $(1, -2, 3)$.
7. Find an equation of a plane through the points $A(2, -2, 3)$, $B(3, -1, 2)$, and $C(4, -4, 0)$.

8. Find an equation of a plane through the point $(3, 2, -1)$ and perpendicular to the line $\vec{l}(t) = \langle 5, 2, 1 \rangle + t \langle -4, 2, 3 \rangle$.

9. Find the distance of the point $A(2, -1, -3)$ from the plane $2x - y + 3z = 4$.