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 perpendicualr 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 $\vec{l}(t) = < 5, 2, 1 > + t < -4, 2, 3 >$.

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