HW 7, MA 1023

1. Find parametric equations for the following lines.
1) The line through the point $P(3,-4,-1)$ parallel to the vector $\vec{u} = \langle 1,1,1 \rangle$.
2) The line through $P(1,-1,2)$ and $Q(2,0,-1)$.

2. Give $\vec{u} = \langle 2,-3,-1 \rangle$, $\vec{v} = \langle 1,4,-2 \rangle$, find

(1) $\vec{u} \cdot \vec{v}$;

(2) $\vec{v} \times \vec{u}$;

(3) $(\vec{u} + \vec{v}) \times (\vec{u} - \vec{v})$.

3. Give $\vec{u} = \langle 4,-2,-4 \rangle$, $\vec{v} = \langle 1,2,-1 \rangle$. Find a unit vector perpendicular to both $\vec{u}$ and $\vec{v}$.

4. Given three points $P(1,-1,2)$, $Q(2,0,-1)$ and $R(0,2,1)$.
1) Find the area of the triangle with vertices P, Q and R.
2) Find a unit vector perpendicular to the plane passing through three points $P(1,-1,2)$, $Q(2,0,-1)$ and $(0,2,1)$.

In exercise 5 and 6, find an equation for the given plane.

5. The plane through $P_0(0,2,-1)$ with normal vector $\vec{n} = \langle 3,-2,-1 \rangle$.

6. The plane through $P(1,1,-1)$, $Q(2,0,2)$ and $R(0,-2,1)$.

In exercise 7 and 8, $\vec{r}(t)$ is the position of a particle in space at time t.
1) Find the particle's velocity and acceleration vectors.
2) Find the particle's speed and direction of motion at the given value of t.

7. $\vec{r}(t) = \langle 2\cos t, 3\sin t, 4t \rangle$ and $t = \frac{\pi}{2}$;

8. $\vec{r}(t) = \langle e^{-t}, 2\cos 3t, 2\sin 3t \rangle$ and $t = 0$.