Name: _____   **/ 25**

30 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. **[4 points]** Compute $\mathbf{u} \times \mathbf{v}$ if $\mathbf{u} = 2\mathbf{i} + 3\mathbf{j}$ and $\mathbf{v} = \mathbf{j} + 2\mathbf{k}$.

2. **[4 points]** Suppose $P(0,0,0)$ is a point in the plane with normal vector $\mathbf{n} = \langle -3, 2, -1 \rangle$. Find the general equation of the plane. Express your answer in the form $ax + by + cz + d = 0$.

3. [4 points] Find a general equation of the plane through the three points $P(3,-1,2)$, $Q(1,0,1)$, and $R(0,-1,1)$. Express your answer in the form $ax+by+cz+d=0$.

4. [5 points] Consider the line passing through the two points $P(4,0,5)$ and $Q(2,3,1)$.

a) Find a vector equation of the line.

b) Find parametric equations of the line.

5. [4 points] Consider points $A(3, -1, 2)$, $B(1, 0, 1)$, and $C(0, -1, 1)$. Find the area of the triangle ABC.

6. [4 points] Find the distance from the point $P(1, 5, -4)$ to the plane $3x - y + 2z = 6$.

Extra Credit. [1 point] Show that $\mathbf{u} \times \mathbf{v}$ is orthogonal to $\mathbf{u} + \mathbf{v}$ and also to $\mathbf{u} - \mathbf{v}$.

EXTRA SPACE FOR ANSWERS