B16.

MATH 1300: Quiz #4
Solutions

1. Given $\mathbf{u} = (1, 2, 3)$ and $\mathbf{v} = (-2, 1, 0)$ compute $\mathbf{u} \times \mathbf{v}$.

Solution.

$$\mathbf{u} \times \mathbf{v} = \left(\begin{vmatrix} 2 & 3 \\ 1 & 0 \end{vmatrix}, -\begin{vmatrix} 1 & 3 \\ -2 & 0 \end{vmatrix}, \begin{vmatrix} 1 & 2 \\ -2 & 1 \end{vmatrix} \right) = (-3, -6, 5).$$

2. Find the parametric equations of the line passing through the point $P(1, 2, 3)$ and orthogonal to the plane $x - y + z = 3$.

Solution.

The vector $(1, -1, 1)$ is orthogonal to the plane, and so it is parallel to the line we seek. Consequently the parametric equations of the line are $x = t + 1$, $x = -t + 2$, $x = t + 3$.

3. We are given $\mathbf{u} = (1, -2, 1, 2)$ and $\mathbf{v} = (1, 1, 0, 3)$.

(a) Find the distance $d(\mathbf{u}, \mathbf{v})$ between **u** and **v.**

(b) Compute $\mathbf{u} - 3\mathbf{v}$.

(c) Write any four-dimensional vector that is orthogonal to **u.**

Solution.

(a) $d(\mathbf{u}, \mathbf{v}) = \sqrt{0^2 + 3^2 + (-1)^2 + 1^2} = \sqrt{11}$

(b) $\mathbf{u} - 3\mathbf{v} = (1, -2, 1, 2) - (3, 3, 0, 9) = (-2, -5, 1, -7)$.

(c) Any non-zero vector **w** such that $\mathbf{u} \bullet \mathbf{w} = 0$ would do. We can take, say, $\mathbf{w} = (2, 1, 0, 0)$