M233 Fall 2005 Homework 1

Due: 19 September 2005

1. Given $\mathbf{u} = \langle 5, -2, 3\rangle$ and $\mathbf{v} = \langle 2, -1, 2\rangle$, find vectors $\mathbf{a}$ and $\mathbf{b}$ such that (i) $\mathbf{a} \parallel \mathbf{v}$, (ii) $\mathbf{a} \perp \mathbf{b}$, and (iii) $\mathbf{u} = \mathbf{a} + \mathbf{b}$.

2. Let $\mathbf{u} = \langle 1, -1, 2\rangle$, $\mathbf{v} = \langle 2, 1, 1\rangle$, and $\mathbf{w} = \langle 3, 4, -2\rangle$. Find scalars s and t such that $\mathbf{w} \times (\mathbf{u} \times \mathbf{v}) = s\mathbf{u} + t\mathbf{v}$.

3. A plane has parametric equations $x = 1+2s+t$, $y = 2-s+3t$, $z = 4+s+t$. A line has symmetric equations $x/2 = y+1 = 7\,(z-1)$. Find their point of intersection.

4. Find symmetric equations for the line of intersection of the two planes $x + 2y - z = 1$ and $2x + y + 2z = 2$.

5. A plane P intersects the coordinate axes in the points $(2, 0, 0)$, $(0, 3, 0)$, and $(0, 0, 5)$. A line ℓ that is perpendicular to P passes through the point $(-1, 2, 2)$. At what point does ℓ intersect the xy-plane?