A Long Quiz

Mark O'Brien

September 16, 2009

Let $\vec{u} = 2\,i + j + 3\,k$, $\vec{v} = 3\,i + k$, and $\vec{w} = 2\,j + k$. Find

1. Write each vector in bracket notation, i.e. $\langle 3, 1, 2 \rangle$.

2.
$$\begin{aligned} &(a) & v \times w \\ &(b) & u \times w \\ &(c) & u + w \\ &(d) & 3\,u \\ &(e) & v \cdot w. \end{aligned}$$

3. Find the normalization of u.

4. Find the projection of v onto u. (Don't remember the formula?? Derive it!)

5. Find a plane containing the three "points" u, v and w.

6. Find where the line containing v and w meets the plane determined by the equation $x - y - z + 1 = 0$. (It does not meet the plane is a valid answer!)

7. **Bonus**
   (a) Describe two properties of both the dot and cross product which are *similar to* usual multiplication of real numbers.
   (b) Describe two properties of both the dot and cross product which are *different from* usual multiplication of real numbers.