The Dot Product, Length, and Distance- HW Problems

1. Calculate $\vec{v} \cdot \vec{w}$, $\|\vec{v}\|$, and $\|\vec{w}\|$.

a. $\vec{v} =< 2, -1 >$, $\vec{w} =< 3,\ 2 >$

b. $\vec{v} = 2\vec{\imath} - 3\vec{\jmath} + \vec{k}$, $\vec{w} = -4\vec{\imath} + \vec{\jmath} + 3\vec{k}$

2. Find a unit vector in the direction of $\vec{v} = 3\vec{\imath} - 2\vec{\jmath} + \vec{k}$.

3. Find all values of x such that the vectors $< x, 2, -5 >$ and $< x, 2, x >$ are perpendicular (ie orthogonal).

4. Let $\vec{v} =< 1, -2, 2 >$ and $\vec{w} =< 3, 1, 2 >$. Find the vector projection of $\vec{v}$ on to $\vec{w}$ and the vector projection of $\vec{w}$ on to $\vec{v}$.

5. Show that $\vec{v} = 4\vec{\imath} - 2\vec{\jmath} + 8\vec{k}$ and $\vec{w} = -6\vec{\imath} + 3\vec{\jmath} - 12\vec{k}$ are parallel using the dot product.