Show all of your work. Full credit will be given only for answers with explanations.

1. (100 points) Check all the correct statements.
   - $\mathbf{u} \cdot \mathbf{v} = -7$, where $\mathbf{u} = \langle 1, 2, 7 \rangle$ and $\mathbf{v} = \langle 4, -2, -1 \rangle$.
   - Length of the projection of the vector $\langle 2, 2, 7 \rangle$ on the line going through the vector $\langle 3, 6, 2 \rangle$ is equal to $\frac{32}{49}$.
   - The angle between the vector $\langle 1, 1, 1 \rangle$ and $\langle 1, 1, 0 \rangle$ is equal to $\arccos \frac{2}{\sqrt{6}}$.
   - $\mathbf{u} \times \mathbf{v} = \mathbf{w}$, where $\mathbf{u} = \langle 1, 1, 0 \rangle$, $\mathbf{v} = \langle 1, 2, 0 \rangle$ and $\mathbf{w} = \langle 1, -1, 0 \rangle$.
   - The vector $\langle 1, 3, 5 \rangle$ is the direction of the line defined by the equation $\frac{x-1}{2} = \frac{y-3}{3} = \frac{z-5}{4}$.
2. Let $A = (2, 0, 0)$, $B = (0, 4, 0)$.

(a) (10 points) Find a direction vector of the line that goes through the points $A$ and $B$.

(b) (10 points) Find a parametric form of the line that goes through the points $A$ and $B$.

(c) (10 points) Find an equation of the line that goes through the points $A$ and $B$. 
3. (10 points) Find $u \times v$, where $u = \langle 1, 1, 0 \rangle$, $v = \langle 1, 0, 1 \rangle$
4. Let $A = \langle 1, -1, 2 \rangle$, $B = \langle -1, 0, 1 \rangle$, and $C = \langle 0, 2, 1 \rangle$.

(a) (10 points) Find a vector $n$ which is perpendicular to the plane that goes through the points $A$, $B$, and $C$.

(b) (10 points) Find the equation of the plane passing through the points $A$, $B$, and $C$. 