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

1. (100 points) Check all the correct statements.
   - $u \cdot v = -7$, where $u = \langle 1, 2, 7 \rangle$ and $v = \langle 4, -2, -1 \rangle$.
   - 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 $\arccos \frac{2}{\sqrt{6}}$.
   - $u \times v = w$, where $u = \langle 1, 1, 0 \rangle$, $v = \langle 1, 2, 0 \rangle$ and $w = \langle 1, -1, 0 \rangle$.
   - 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 $\mathbf{u} \times \mathbf{v}$, where $\mathbf{u} = \langle 1, 1, 0 \rangle$, $\mathbf{v} = \langle 1, 0, 1 \rangle$
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 $C$. 