1. The matrix $B$ is the echelon form of the augmented matrix $[A\vert b]$, which corresponds to a certain system of linear equations:

\[
B = \begin{pmatrix}
1 & 0 & 2 & 1 & 1 \\
0 & 1 & 0 & 0 & 2 \\
0 & 0 & 0 & 1 & 1 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}
\]

Decide if the following statements are true or false, and give a brief justification for your answer.

(a) $B$ is the reduced echelon form of $[A\vert b]$.

(b) At least one row of the system $[A\vert b]$ is a linear combination of the others.

(c) The system corresponding to the matrix $[A\vert b]$ has just one solution.

(d) $b$ is a linear combination of the columns of $A$.

(e) $\text{rank}([A\vert b]) = 2$. 

2. Prove that \( \mathbf{v} = [1, 2, 0], \mathbf{w} = [0, 0, 2], \mathbf{x} = [0, 2, 1] \) are linearly independent. Prove that \( \mathbb{R}^3 \) is the span(\( \mathbf{v}, \mathbf{w}, \mathbf{x} \)).

3. Prove that if \( \mathbf{x}, \mathbf{y}, \mathbf{z} \) are linearly independent then \( \mathbf{x} - \mathbf{y}, \mathbf{x} - \mathbf{z}, \mathbf{y} + \mathbf{z} \) are linearly independent.