1. If the given statement is true, write “True” below the statement. If the given statement is false, write “False” below the statement. No explanation is required.

(a) Every elementary row operation is reversible.

(b) A 7x10 matrix has seven columns.

(c) Elementary row operations on an augmented matrix never change the solution set of the associated linear system.

(d) Two matrices are row equivalent if they have the same number of rows.

(e) An inconsistent system has more than one solution.

(f) Two linear systems are equivalent if they have the same solution set.

(g) In some cases, a matrix may be row reduced to more than one matrix in RREF, using different sequences of row operations.

(h) A free variable in a linear system is a variable that corresponds to a pivot column in the coefficient matrix.

2. Construct an example to show why the following statement is false:

If one row in an echelon form of an augmented matrix is \([0 \ 0 \ 0 \ 0 \ 3 \ 0]\), then the associated linear system is inconsistent.

Please include a brief explanation (using complete sentences) of why your example shows that the statement is false.
3. Let $\vec{e}_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$, $\vec{e}_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, and $\vec{u} = \begin{bmatrix} v \\ w \end{bmatrix}$. Show how to write $\vec{u}$ as a linear combination of $\vec{e}_1$ and $\vec{e}_2$.

4. Let $\vec{e}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $\vec{e}_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$, and $\vec{e}_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$. Is it possible to find an example of a vector in $\mathbb{R}^3$ which is not a linear combination of $\vec{e}_1$, $\vec{e}_2$, and $\vec{e}_3$? Please write “yes” or “no” and explain the reason for your answer using complete sentences.

5. Let $\vec{u} = \begin{bmatrix} 2 \\ 1 \\ 0 \\ 0 \end{bmatrix}$, and let $\vec{v} = \begin{bmatrix} -1 \\ 3 \\ 1 \\ 0 \end{bmatrix}$.

(a) Give an example of a vector in $\mathbb{R}^4$ which is not in the span of $\vec{u}$ and $\vec{v}$. Please include an explanation, using complete sentences, of why your vector is not in the span of $\vec{u}$ and $\vec{v}$.

(b) Give an example of a vector in $\mathbb{R}^4$ which is in the span of $\vec{u}$ and $\vec{v}$. Please include an explanation, using complete sentences, of why your vector is in fact in the span of $\vec{u}$ and $\vec{v}$. 