1. Let $\mathbf{a}_1 = \begin{bmatrix} 1 \\ 0 \\ 3 \end{bmatrix}$ and $\mathbf{a}_2 = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$.

1A) Find a vector $\mathbf{b} \in \mathbb{R}^3$ different from both $\mathbf{a}_1$ and $\mathbf{a}_2$ that is in Span$\{\mathbf{a}_1, \mathbf{a}_2\}$ and explain how you found $\mathbf{b}$.

1B) Find a vector $\mathbf{d} \in \mathbb{R}^3$ that is obviously *not* in Span$\{\mathbf{a}_1, \mathbf{a}_2\}$ and explain why $\mathbf{d}$ is not in that span.

2. Let $\mathbf{c}_1 = \begin{bmatrix} 4 \\ 2 \\ 0 \\ 1 \end{bmatrix}$, $\mathbf{c}_2 = \begin{bmatrix} 8 \\ 4 \\ 0 \\ 2 \end{bmatrix}$, $\mathbf{c}_3 = \begin{bmatrix} 5 \\ 5 \\ 2 \\ 2 \end{bmatrix}$, and $\mathbf{c}_4 = \begin{bmatrix} -1 \\ 7 \\ 6 \\ 2 \end{bmatrix}$. Also, let $\mathbf{v} = \begin{bmatrix} 22 \\ 16 \\ 4 \\ 7 \end{bmatrix}$ and $\mathbf{w} = \begin{bmatrix} 8 \\ 11 \\ 7 \\ 4 \end{bmatrix}$.

2A: Determine if $\mathbf{v}$ a linear combination of $\mathbf{c}_1$, $\mathbf{c}_2$, $\mathbf{c}_3$, and $\mathbf{c}_4$, and if it is, find all possible solutions of the vector equation $x_1\mathbf{c}_1 + \cdots + x_4\mathbf{c}_4 = \mathbf{v}$. Express your values of the x_i's in the agreed-upon format. Show any RREF matrices used in your solution.

2B: Explain whether $\mathbf{w}$ is in the Span of $\{\mathbf{c}_1,\ \mathbf{c}_2,\ \mathbf{c}_3,\ \mathbf{c}_4\}$. Again show any RREF matrices used in your explanation.