1. Let $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$, $\mathbf{v}_2 = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$, $\mathbf{v}_3 = \begin{bmatrix} 2 \\ -7 \\ 5 \end{bmatrix}$. Also, let $\mathbf{b} = \begin{bmatrix} -5 \\ 11 \\ -5 \end{bmatrix}$ and $\mathbf{c} = \begin{bmatrix} 6 \\ -10 \\ 4 \end{bmatrix}$.

1A. In terms of the definition, explain what it means to ask, "is $\mathbf{b}$ a *linear combination* of $\mathbf{v}_1$, $\mathbf{v}_2$, and $\mathbf{v}_3$?" Your answer should start with, "are there scalars $\alpha_1 \ldots$".

1B. Now, determine if $\mathbf{b}$ actually *is* a linear combination of $\mathbf{v}_1$, $\mathbf{v}_2$, and $\mathbf{v}_3$. Explain how you decide.

1C. To determine if $\mathbf{c}$ is in the span of $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is equivalent to solving what system of linear equations?

1D. Find all solutions to the system produced in part (C).

1E. What specific solution do you get if you set any and all free variables in part (D) to the number 2? Verify that your solution works by evaluating the corresponding linear combination of $\mathbf{v}_1$, $\mathbf{v}_2$, and $\mathbf{v}_3$