1. Let $\mathbf{b}$ and $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_n$ be vectors in $\mathbf{R}^m$. Complete the following sentence so that it gives the definition of *linear combination*: "We say $\mathbf{b}$ is a linear combination of the the vectors $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_n$ if and only if..."

2. Let $\mathbf{a}_1 = \begin{bmatrix} 2 \\ 1 \\ -3 \end{bmatrix}$, $\mathbf{a}_2 = \begin{bmatrix} 6 \\ 3 \\ -9 \end{bmatrix}$, $\mathbf{a}_3 = \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$. $\mathbf{a}_4 = \begin{bmatrix} 10 \\ 4 \\ -4 \end{bmatrix}$. Also, let $\mathbf{b} = \begin{bmatrix} 16 \\ 8 \\ 26 \end{bmatrix}$ and $\mathbf{c} = \begin{bmatrix} 26 \\ 8 \\ 16 \end{bmatrix}$.

2A. Is $\mathbf{b}$ in the span of $\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3, \mathbf{a}_4\}$? Explain your answer. Show any matrices and corresponding rref's you use.

2B. Let A be the matrix whose columns are $\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3$ and $\mathbf{a}_4$. Express all solutions of $A\mathbf{x} = \mathbf{c}$ in parametric vector form, that is, as $\mathbf{p} + \mathbf{v}_h$ where $\mathbf{p}$ is a particluar solution of $A\mathbf{x} = \mathbf{c}$ and $\mathbf{v}_h$ is all solutions of the corresponding homogeneous equation $A\mathbf{x} = \mathbf{0}$. Show any relevant matrices used in your work.

2C. Use your work in (2B) to find two nontrivial solutions $\mathbf{s}_1$ and $\mathbf{s}_2$ of $A\mathbf{x} = \mathbf{0}$. CIRCLE your answers.

2D. Now let T be the matrix whose columns are $\mathbf{a}_1, \mathbf{a}_3$ and $\mathbf{a}_4$ (so T looks like A if you take out A's second column). What is v_h now? That is, what are the solutions of $T\mathbf{x} = \mathbf{0}$?