1. Let $A = \begin{bmatrix} 7 & 12 & 2 & -17 \\ -5 & -9 & -1 & 13 \\ 2 & 1 & 3 & 0 \\ 3 & 2 & 4 & -1 \end{bmatrix}$, let $\mathbf{c} = \begin{bmatrix} 37 \\ -26 \\ 13 \\ 19 \end{bmatrix}$ and let $\mathbf{v}_1$, $\mathbf{v}_2$, $\mathbf{v}_3$, and $\mathbf{v}_4$ be the corresponding columns of A.

1A: Write all the solutions of $A\mathbf{x} = \mathbf{c}$ in the form $\mathbf{p} + \mathbf{v}_h$ where $\mathbf{p}$ is a particular solution of $A\mathbf{x} = \mathbf{c}$ and $\mathbf{v}_h$ represents all solutions of the corresponding homogeneous equation. Write down any RREF matrix you used to help solve this problem.

1B: Find *another* particular solution and explain how you got it.

1C: Let $\mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$ be any arbitrary vector in $\mathbf{R}^4$. What conditions (if any) must b_1, b_2, b_3 and b_4 satisfy in order for $\mathbf{b}$ to be in the span of $\mathbf{v}_1$, $\mathbf{v}_2$, $\mathbf{v}_3$, and $\mathbf{v}_4$? Use the method discussed in class, and again, write down any RREF matrix you used to help solve this problem.

1D: Verify that the entries of $\mathbf{c}$ do indeed satisfy these conditions; show your work.

1E: Does $\mathbf{R}^4 = \text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3, \mathbf{v}_4\}$? *Explain* your answer.