Let $A = \begin{bmatrix} 2 & 5 & 10 & -6 & 12 \\ 1 & 2 & 5 & -3 & 6 \\ 3 & 10 & 15 & -8 & 14 \\ 1 & 3 & 5 & -2 & 2 \end{bmatrix}$ and $b = \begin{bmatrix} 11 \\ 7 \\ 7 \\ 2 \end{bmatrix}$; then RREF of $[A|b]$ is $\begin{bmatrix} 1 & 0 & 5 & 0 & -6 & 7 \\ 0 & 1 & 0 & 0 & 0 & -3 \\ 0 & 0 & 1 & -4 & -2 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$.

1A. Use the above information to express all solutions of $Ax = b$ in the form $p + v_h$ where $p$ is a particular solution of $Ax = b$ and $v_h$ represents all solutions of the corresponding homogeneous equation.

1B. In terms of the definition of linearly independent, do the columns of $A$ form a linearly independent set? Explain your answer.

1C. Label the columns of $A$ as $a_1, a_2, \ldots, a_5$. Show explicitly how to express $a_5$ as a linear combination of the first four columns. Give two different ways to do this, one of which involves a non-zero weight for column $a_3$, while the other does not use $a_3$ (ie, its weight is 0). (Write your answers using the symbols $a_1, a_2, \ldots, a_5$; don’t copy over all those columns of numbers).

1D. Explain why column $a_2$ can not be written as linear combination of the other four columns.

1E. Do the columns of $A$ span $\mathbb{R}^4$? Why or why not.