1. Carefully state the definition of “linear equation”. Give two examples, each in three variables.

The remaining problems all concern the following system.

\[
\begin{align*}
    x_1 + 3x_2 + 2x_3 + 4x_4 &= 10 \\
    2x_1 + 6x_2 + 5x_4 &= 13 \\
    3x_1 + 9x_2 - 10x_3 &= 2 \\
    x_1 + 3x_2 - 2x_3 + 6x_4 &= 8 \\
    2x_3 - x_4 &= 1
\end{align*}
\]

2. Write the above system as a matrix equation.
3. Write the above system as an augmented matrix. Put this in echelon form, justifying each step using elementary row operations. Using the echelon form, find the general solution to the system.

4. Write the above system as an augmented matrix. Put this in row canonical form, justifying each step using elementary row operations. Using the row canonical form, find the general solution to the system.

5. Write the homogeneous system associated to the above system. Use the solution to this homogeneous system, together with the particular solution \((1, 1, 1, 1)\) to give the general solution to the original system.