1. Let $A = \begin{bmatrix} 1 & 3 & 5 \\ -2 & -6 & 7 \end{bmatrix}$.

   (a) Find all solutions to the homogeneous system $A\mathbf{x} = \mathbf{0}$.

   (b) Find all solutions to $A\mathbf{x} = \mathbf{b}$ where $\mathbf{b} = \begin{bmatrix} -3 \\ 9 \end{bmatrix}$.

2. Find all solutions to $A\mathbf{x} = \mathbf{b}$ where $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 1 & 3 \\ 4 & 8 & 7 & 11 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} -9 \\ -13 \\ -31 \end{bmatrix}$

3. Create an example of a matrix A and vector $\mathbf{b}$ such that $A\mathbf{x} = \mathbf{b}$ has infinitely many solutions and $A\mathbf{x} = \mathbf{0}$ has only the trivial solution.