1. Verify if the vectors \( \mathbf{v}_1 = (3, 2, -4), \mathbf{v}_2 = (5, 2, -3) \) and \( \mathbf{v}_3 = (4, 1, -2) \) form a basis for \( \mathbb{R}^3 \).

2. Find three different ways to express the vector \( (1, 2, 3) \) as a linear combination of \( \mathbf{v}_1 = (1, 0, 0), \mathbf{v}_2 = (0, 2, 0) \) and \( \mathbf{v}_3 = (0, 0, 3) \), and \( \mathbf{v}_4 = (1, 1, 1) \).

3. Show that the set of vectors \( \mathbf{v}_1 = (1, 2, -2), \mathbf{v}_2 = (3, -1, 1) \) and \( \mathbf{v}_3 = (4, 1, -1), \mathbf{v}_4 = (1, 3, 6) \) span \( \mathbb{R}^3 \) and create a basis by removing vectors that are linear combinations of the predecessors.

4. Show that the vector \( \mathbf{u} = (-1, 1, 0, 2) \) is in the orthogonal complement of \( W = \text{span} \{(6, 2, 7, 2), (1, 1, 3, 0), (4, 0, 9, 2)\} \).

5. Find a basis for \( W = \text{span} \{(1, 1, -3), (5, -4, -4), (7, -6, 2)\} \). Also find a basis for \( W^\perp \).

6. Determine the conditions satisfied by a vector \( \mathbf{b} \) in order to lie in \( W = \text{span} \{(1, 1, 0, 0), (0, 0, 1, 1), (-2, 0, 2, 2), (4, 2, -1, -1)\} \).

7. Find a basis for the row space of the matrix \( A = \begin{bmatrix} -1 & 3 & 3 & 2 \\ 2 & 0 & 6 & 1 \\ -2 & 4 & 2 & 4 \end{bmatrix} \).

8. Construct a matrix whose null space is the span of the vectors \( \text{span} \{(1, -1, 3, 2), (2, 0, -2, 4)\} \).

9. Find a subset of the vectors \( \{(1, -2, 0, 3), (2, -4, 0, 6), (-1, 1, 2, 0), (0, -1, 2, 3)\} \) that forms a basis for the space spanned by the vectors.