(1) Find a basis for the column space of \( A = \begin{bmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{bmatrix} \) that consists of the column vectors of \( A \):

(2) Find a basis for the row space of \( A = \begin{bmatrix} 1 & 4 & 4 & 2 \\ 2 & 1 & 3 & 0 \\ -1 & 3 & 2 & 2 \end{bmatrix} \) that consists of the row vectors of \( A \):

(3) Find a subset of the vectors that form the basis for the space spanned by the vectors; then express the remaining vectors in the set as a linear combination of the basis vectors.
   
   (a) \( \mathbf{v}_1 = (1, 2, -1, 1) \), \( \mathbf{v}_2 = (4, 0, -6, 2) \), \( \mathbf{v}_3 = (1, 10, -11, 3) \).
   
   (b) \( \mathbf{v}_1 = (1, -2, 0, 3) \), \( \mathbf{v}_2 = (2, -4, 0, 6) \), \( \mathbf{v}_3 = (-1, 1, 2, 0) \), \( \mathbf{v}_4 = (0, -1, 2, 3) \).

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

(5) Find a linear system whose solution space is the span of the vectors \( \mathbf{v}_1 = (1, 1, 0, 0) \), \( \mathbf{v}_2 = (0, 0, 1, 1) \), \( \mathbf{v}_3 = (-2, 0, 2, 2) \), \( \mathbf{v}_4 = (4, 2, -1, -1) \).

(6) Confirm that the rank and nullity of the matrix

\[
A = \begin{bmatrix} 1 & 4 & 5 & 2 \\ 2 & 1 & 3 & 0 \\ -1 & 3 & 2 & 2 \end{bmatrix}
\]

satisfy the formula in dimension theorem.

(7) Express the rank of \( A \) in terms of \( t \): \( A = \begin{bmatrix} 1 & 1 & t \\ 1 & t & 1 \\ 1 & 1 & t \end{bmatrix} \).

(8) Verify that \( \text{rank}(A) = \text{rank}(A^T) \) for the matrix

\[
A = \begin{bmatrix} 2 & 0 & -1 \\ 1 & 2 & 3 \\ 3 & -2 & -5 \\ 4 & 2 & 5 \end{bmatrix}
\]