Problem 1. Show that \( \{x^3 + 2, x^3 - x - 1, 3x^2 + x, x^3 + x - 1\} \) is a basis of \( P_3 \).

Problem 2. Determine the dimension of the following subspace of \( \mathbb{R}^4 \)
\[
W = \{(a + b - c, a + 2b + 3c, a - b, c - b) : a, b, c \text{ are real numbers}\}
\]

Problem 3. Determine if the set of vectors
\[
S = \{1 + x + x^2, 1 - x - x^2, 1 + 2x - 2x^2, x + x^2\}
\]

is linearly dependent.

Problem 4. Please, find ANY NON standard basis of \( M_{2,2} \). Do not forget to prove that the set of vectors you present is a basis!