Directions: Please answer all questions in the space provided. Use of calculators or any form of electronic communication device is strictly forbidden on this quiz.

1. Suppose a matrix $A$ has 45 columns and its rows are linearly independent. Also, the set $\{x \in \mathbb{R}^{45} \mid Ax = 0\}$ is 7-dimensional. How many rows does $A$ have? Explain.

2. The set $B = \{1 + x + x^2, 2 + x + x^2, 1 - x + x^2\}$ is a basis for $P_2$. Find the coordinate vector $[3 + x^2]_B$. 