1. Carefully state the definition of “spanning”. Give two examples from $P_2(t)$.

2. Suppose that $B$ is an invertible $5 \times 5$ matrix. Prove that $B^2$ is also invertible.
The remaining three problems all concern the matrix \( A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} \).

3. Be sure to justify your answers to the following questions.  
(a) Is \( A \) diagonal?  
(b) Is \( A \) triangular?  
(c) Calculate \( tr(A) \).  
(d) Calculate \( A^T \).  
(e) Is \( A \) orthogonal?

4. Find a symmetric matrix \( B \) and a skew-symmetric matrix \( C \) such that \( A = B + C \).

5. Let \( D = A^2 + 2A \). Calculate \( D \), and calculate \( D^{-1} \).