

3. (10 points) Let $V = \mathbb{R}^3$ and let W be the subset consisting of vectors $\begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3$ such that $x^2 + 2xy + y^2 = 0$. Prove that W is a subspace, or find an example showing that it is not closed under addition or scalar multiplication.

4. (15 points) Do the following functions span the vector space of polynomials of degree ≤ 2 ?

$$1; 1 - x; 1 + 2x; x^2; x^3$$

5. Let $\mathbf{B} = \begin{pmatrix} 2 & 1 & 0 & 3 \\ 4 & 1 & 1 & 1 \\ 2 & 3 & 0 & 3 \end{pmatrix}$. The row echelon form of \mathbf{B} is $\begin{pmatrix} 2 & 1 & 0 & 3 \\ 4 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix}$.