

Chapter 3 Homework from Kreyszig

Vector Spaces (Kreyszig page 329)

Is the given set (taken with the usual addition and scalar multiplication) a vector space? (Give a reason.) If your answer is yes, find the dimension and basis.

1. All vectors in R^3 satisfying $5v_1 - 3v_2 + 2v_3 = 0$
2. All vectors in R^3 satisfying $2v_1 + 3v_2 - v_3 = 0$, $v_1 - 4v_2 + v_3 = 0$
3. All 2×3 matrices with all entries nonnegative
4. All symmetric 3×3 matrices
5. All vectors in R^5 with the first three components 0
6. All vectors in R^4 with $v_1 + v_2 = 0$, $v_3 - v_4 = 1$
7. All skew-symmetric 2×2 matrices
8. All $n \times n$ matrices \mathbf{A} with fixed n and $\det \mathbf{A} = 0$
9. All polynomials with positive coefficients and degree 3 or less
10. All functions $f(x) = a \cos x + b \sin x$ with any constants a and b
11. All functions $f(x) = (ax + b)e^{-x}$ with any constants a and b
12. All 2×3 matrices with the second row any multiple of $[4 \ 0 \ -9]$