4-2 In-Class Exercise

1. Use the Subspace Test to determine whether the set is a subspace of M_{nn}.

The set of all $n \times n$ matrices A such that $A^T = -A$.

2. Use the Subspace Test to determine whether the set is a subspace of R^4.

All vectors of the form $(a, 0, b, 0)$.

4-2 Suggested Exercises

1. Use the Subspace Test to determine whether the set is a subspace of M_{nn}.

The set of all $n \times n$ matrices A such that $\text{tr}(A) = 0$.

2. Use the Subspace Test to determine whether the set is a subspace of R^3.

All vectors of the form (a, b, c), where $b = a + c$.

3. Use the Subspace Test to determine whether the set is a subspace of P_3.

All polynomials of the form $a_0 + a_1x + a_2x^2 + a_3x^3$ in which a_0, a_1, a_2, and a_3 are rational numbers.

4. Use the Subspace Test to determine whether the set is a subspace of M_{22}.

All 2×2 matrices A such that

$$A\begin{bmatrix} 0 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ -2 & 1 \end{bmatrix} A$$

5. Use the Subspace Test to determine whether the set is a subspace of R^4.

$$\text{All vectors } \mathbf{x} \text{ in } R^4 \text{ such that } A\mathbf{x} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \text{ where}$$

$$A = \begin{bmatrix} 0 & -1 & 0 & 2 \\ -1 & 1 & 0 & 1 \end{bmatrix}$$

6. If T_A is multiplication by a matrix A with three columns, then the kernel of T_A is one of four possible geometric objects. What are they? Explain how you reached your conclusion.