

Math 2550 - HW 6 - Part 2

Subspaces

1. Consider the vector space $V = \mathbb{R}^3$ over the field of scalars $F = \mathbb{R}$. For each problem: (i) List four elements from W , and (ii) determine whether W is a subspace of $V = \mathbb{R}^3$.

(a) $W = \{\langle a, 0, 0 \rangle \mid a \text{ in } \mathbb{R}\}$

(b) $W = \{\langle a, 1, 2 \rangle \mid a \text{ in } \mathbb{R}\}$

(c) $W = \{\langle a, b, c \rangle \mid \text{where } b = a + c, \text{ and } a, b, c \text{ are in } \mathbb{R}\}$

(d) $W = \{\langle a, b, c \rangle \mid \text{where } b = a + c + 1, \text{ and } a, b, c \text{ are in } \mathbb{R}\}$

2. Consider the vector space $V = M_{2,2}$ of 2×2 matrices over the field of scalars $F = \mathbb{R}$. For each problem: (i) List four elements from W , and (ii) determine whether W is a subspace of $V = M_{2,2}$.

(a) $W = \left\{ \begin{pmatrix} a & b \\ c & d \end{pmatrix} \mid a + b + c + d = 0 \right\}$

(b) $W = \left\{ \begin{pmatrix} a & b \\ c & d \end{pmatrix} \mid \det \begin{pmatrix} a & b \\ c & d \end{pmatrix} = 0 \right\}$

3. Consider the vector space $V = P_2 = \{a + bx + cx^2 \mid a, b, c \text{ in } \mathbb{R}\}$ over the field of scalars $F = \mathbb{R}$. For each problem: (i) List four elements from W , and (ii) determine whether W is a subspace of $V = P_2$.

(a) $W = \{1 + bx + cx^2 \mid b, c \text{ are in } \mathbb{R}\}$

(b) $W = \{a + bx + cx^2 \mid a + 2b = 0 \text{ and } a, b, c \text{ are in } \mathbb{R}\}$