MATH 2130 LINEAR ALGEBRA
HOMEWORK 4
DUE 2025 SEPTEMBER 21

Problem 1 (P3)

Show that

$$\left\{ (x, y, z) \in \mathbb{R}^3 \;\middle|\; (x, y, z) \cdot (-2, 1, 3) = 0 \right\}$$

is closed under addition.

Problem 2 (P3)

Show that

$$\left\{ (x, y, z) \in \mathbb{R}^3 \;\middle|\; (x, y, z) \cdot (-2, 1, 3) = 5 \right\}$$

is not a vector space under the usual vector operations.

Problem 3 (P3)

Show that

$$\left\{ \begin{bmatrix} a & b \\ a+b & b^2 \end{bmatrix} \;\middle|\; a, b \in \mathbb{R} \right\}$$

is not a vector space under the usual matrix operations.

Problem 4 (P3)

Show that the set of real-valued functions with $f(x) > x$ for all x is not a vector space under the natural operations.

Problem 5 (P3)

Show that

$$\left\{ (x, y) \in \mathbb{R}^2 \;\middle|\; x^2 = y^2 \right\}$$

is closed under scalar multiplication.