MAT 67 Homework 3

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1. Let V be the set of all pairs (x, y) of real numbers and suppose vector addition and scalar multiplication are defined in the following way:

$$(x_1, y_1) + (x_2, y_2) = (x_1 + x_2, y_1 + y_2)$$
$$a(x, y) = (ax, y)$$

for any scalar a in the field of real numbers.

Is the set V a vector space over the field $\mathbb{R}$?

The set V is not a vector space over the field $\mathbb{R}$ for it fails to hold for INSERT-THE-REASON-IT-DOESNT-HOLD.

Proof. Let $\vec{u} \in V$ and $c, k \in \mathbb{R}$. Let's check associativity over scalar multiplication.

$$\begin{aligned} c(k\vec{u}) &= c(k(u_1, u_2)) \\ &= c(ku_1, u_2) \\ &= \end{aligned}$$

□

2. Let W_1 and W_2 be subspaces of a vector space V such that their union $W_1 \cup W_2$ is also a subspace of V.

Prove that either W_1 is contained in W_2 or vice versa.