Name: Solution.

1. Let V be the set of all ordered pairs of real numbers, and consider the following addition and scalar multiplication operations on $\vec{u} = (u_1, u_2)$ and $\vec{v} = (v_1, v_2)$:

$$\vec{u} + \vec{v} = (u_1 + v_1, u_2 + v_2) \quad \text{and} \quad k\vec{u} = (0, ku_2).$$

Show that Axiom 7 holds in V.

$$k\left(\vec{u} + \vec{v}\right) = k\left(\left(u_1, u_2\right) + \left(v_1, v_2\right)\right)$$

$$= k\left(u_1 + v_1, \; u_2 + v_2\right)$$

$$= \left(0, \; k\left(u_2 + v_2\right)\right)$$

$$= \left(0, \; ku_2 + kv_2\right)$$

$$= \left(0, \; ku_2\right) + \left(0, kv_2\right)$$

$$= k\left(u_1, u_2\right) + k\left(v_1, v_2\right)$$

$$= k\vec{u} + k\vec{v}.$$