

Assume  $U = \{(x, y) \in \mathbb{R}^2 \mid x \neq 0, x, y \in \mathbb{R}\} \cup \{(0, 0)\}$

$U$  is closed under scalar multiplication:

$$\bullet \forall \lambda \in \mathbb{R}, \lambda \neq 0$$

$$\lambda(x, y) = (\lambda x, \lambda y), \lambda x \neq 0 \Rightarrow \lambda(x, y) \in U.$$

$$\bullet \lambda = 0 \Rightarrow \lambda(x, y) = (0, 0) \in U$$

However,  $U$  is not closed under addition:

Assume  $a = (1, 1), b = (-1, 1) \in U$ .

$$a + b = (1, 1) + (-1, 1) = (0, 2) \notin U \quad (x=0).$$