ex $W = \{ (a,1) \,,\; a \in R \}$

ex $W = \left\{ \begin{bmatrix} a \\ 1 \end{bmatrix}, a \in R \right\}$ is it a v.space ?? use usual addition and scalar multiplication:

sol: ① closed under addition

$$\begin{bmatrix} 3 \\ 1 \end{bmatrix} + \begin{bmatrix} -5 \\ 1 \end{bmatrix} = \begin{bmatrix} -2 \\ 2 \end{bmatrix} \notin W$$

→ it is not a vector space.

$$8\begin{bmatrix} 3 \\ 1 \end{bmatrix} = \begin{bmatrix} 24 \\ 8 \end{bmatrix} \notin W. \quad X$$

8 axioms:

$x, y, z \in V$, $\alpha, \beta \in R$.

(A1) $x + y = y + x$.

(A2) $(x+y) + z = x + (y+z)$

(A3) there exist an element 0 in V such that $x + 0 = x$

(A4) for each $x \in V$, $-x \in V$ such that $x + (-x) = 0$

(A5) $\alpha(x+y) = \alpha x + \alpha y$

(A6) $(\alpha+\beta)x = \alpha x + \beta x$

(A7) $(\alpha\beta)x = \alpha(\beta x)$

(A8) $1 . x = x$

the set, together with the (2) operations and the 8 axioms $\Rightarrow$ is a vector space.

properties (V is a vector space, $x \in V$)

1. $0 x = \mathbf{0}$ — vector

   real number

2. $x + y = \mathbf{0} \rightarrow x = -y$

3. $-1 x = x$

4. $x + y = x + z \rightarrow y = z$

5. $\alpha x = \mathbf{0} \Rightarrow \alpha = 0$ or $x = \mathbf{0}$.

   scalar — vector.