Vectors Cheat Sheet

by Kyyul via cheatography.com/162958/cs/34362/

Axioms For Vector Spaces

To show that a given set with two operations is **NOT** a vector space, we need to show properly that at least one property of the ten above is violated.

(1) If $\mathbf{u}$, $\mathbf{v} \in V$, then $\mathbf{u} \oplus \mathbf{v} \in V$ [CLOSURE UNDER ADDITION]

(2) If $\mathbf{u} \oplus \mathbf{v} = \mathbf{v} \oplus \mathbf{u}$ [COMMMUTATIVE LAW]

(3) If $(\mathbf{u} \oplus \mathbf{v}) \oplus \mathbf{w} = \mathbf{u} \oplus (\mathbf{v} \oplus \mathbf{u})$ ['$\oplus$' IS ASSOCIATIVE]

(4) V contains the object "0" which satisfies $\mathbf{u} \oplus 0 = 0 \oplus \mathbf{u}$

For each $\mathbf{u} \in V$, there exist an object '$\mathbf{-u}$' such that $\mathbf{u} \oplus \mathbf{-u} = 0$ [ADDITIVE INVERSE]

(6) If $\mathbf{u} \in V$*and $\mathbf{k} \in K$, then $k \odot \mathbf{u} \in V$ [CLOSURE UNDER MULTIPLICATION]

(7) $k \odot (\mathbf{u} \oplus \mathbf{v}) = (k \odot \mathbf{u}) \oplus (k \odot \mathbf{v})$ [DISTRIBUTIVE LAW]

(8) $(k+l) \odot \mathbf{u} = (k \odot \mathbf{u}) \oplus (\mathbf{l} \odot \mathbf{u})$

(9) $k \odot (l \odot \mathbf{u}) = (kl \odot \mathbf{u})$

(10) $1 \odot \mathbf{u} = \mathbf{u}$

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