Ten Axioms of Vector Spaces

Let V be a vector space. Then for all vectors $\mathbf{u}, \mathbf{v}, \mathbf{w} \in V$ and scalars c and d the following holds true:

1. $\mathbf{u} + \mathbf{v} \in V$;
2. $\mathbf{u} + \mathbf{v} = \mathbf{v} + \mathbf{u}$;
3. $(\mathbf{u} + \mathbf{v}) + \mathbf{w} = \mathbf{u} + (\mathbf{v} + \mathbf{w})$;
4. There is a **zero** vector $\mathbf{0} \in V$ such that $\mathbf{u} + \mathbf{0} = \mathbf{u}$;
5. For each $\mathbf{u} \in V$, there is a vector $-\mathbf{u} \in V$ such that $\mathbf{u} + (-\mathbf{u}) = \mathbf{0}$;
6. $c\mathbf{u} \in V$;
7. $c(\mathbf{u} + \mathbf{v}) = c\mathbf{u} + c\mathbf{v}$;
8. $(c + d)\mathbf{u} = c\mathbf{u} + d\mathbf{u}$;
9. $c(d\mathbf{u}) = (cd)\mathbf{u}$;
10. $1\mathbf{u} = \mathbf{u}$.