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2. Algebra

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Forcing Linearity Numbers

Let R be a ring with identity and V a unital R-module and consider the set $M_R(V) = \{f : V \to V | f(rv) = rf(v), \forall r \in R, \forall v \in V\}$. Under the operations of function addition and composition of maps, $M_R(V)$ is a nearring which contains $\mathrm{End}_R(V)$, the ring of R-endomorphisms of V. A collection $\mathcal{S} = \{W_\alpha\}_{\alpha \in \mathcal{A}}$ of proper submodules of V is said to *force linearity* on V if whenever $f \in \mathrm{Hom}_R(W_\alpha, V)$ for each $\alpha \in \mathcal{A}$, then $f \in \mathrm{End}_R(V)$. The minimum number of proper submodules of V needed to force linearity is called the *forcing linearity number* for V, denoted by $fln(V)$.

We determine the fln for vector spaces, modules over integral domains, not fields, and modules over local rings, not integral domains.