

**Invariants of group representations, dimension/degree
duality and normal forms of vector fields**

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We develop a constructive approach to the problem of polynomial first integrals for linear vector fields. As an application we obtain a new proof of the theorem of Wietzenbock about finiteness of the number of generators of the ring of constants of a linear derivation in the polynomial ring. Moreover, we propose an alternative approach to the analyticity property of the normal form reduction of a germ of vector field with nilpotent linear part in a case considered by Stolovich and Verstringe.