Journal of Mathematical Analysis and Applications

Volume 151, Issue 1, 1 September 1990, Pages 80-107

Symmetry Lie algebras of nth order ordinary differential equations

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https://doi.org/10.1016/0022-247X(90)90244-A

Abstract

We show that an nth (n â©¾ 3) order linear ordinary differential equation has exactly one of $n + 1$, $n + 2$, or $n + 4$ (the maximum) point symmetries. The Lie algebras corresponding to the respective numbers of point symmetries are obtained. Then it is shown that a necessary and sufficient conditon for an nth (n â©¾ 3) order equation to be linearizable via a point transformation is that it must admit the n dimensional Abelian algebra $nA_1 = A_1$ âŠ• A_1 âŠ• â€¦ âŠ• A_1. We discuss in detail the symmetry realizations of $(n$ â^' $1)A_1$ âŠ•$_s A_1$. Finally, we prove that an nth (n â©¾ 3) order equation $q^{(n)} = H(t, q,$ â€¦, q^{n â^' $1})$ cannot admit exactly an $n + 3$ dimensional algebra of point symmetries which is a subalgebra of nA_1 âŠ•, gl(2, R).

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