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Finite-dimensional Lie Subalgebras of the Weyl Algebra

We classify up to isomorphism all finite-dimensional Lie algebras that can be realised as Lie subalgebras of the complex Weyl algebra A_1. The list we obtain turns out to be countable and, for example, the only non-solvable Lie algebras with this property are: $\mathfrak{sl}(2)$, $\mathfrak{sl}(2) \times \mathbf{C}$ and $\mathfrak{sl}(2) \ltimes \mathcal{H}_3$. We then give several different characterisations, normal forms and isotropy groups for the action of $\mathrm{Aut}(A_1) \times \mathrm{Aut}(\mathfrak{sl}(2))$ on a class of realisations of $\mathfrak{sl}(2)$ in A_1.

Keywords: Finite-dimensional Lie subalgebras, Weyl algebra, embeddings.

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