

Integrability and Linearizability of a Family of Three-Dimensional Polynomial Systems

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We investigate the local integrability and linearizability of a family of three-dimensional polynomial systems with the matrix of the linear approximation having the eigenvalues $1, \zeta, \zeta^2$, where ζ is a primitive cubic root of unity. We establish a criterion for the convergence of the Poincaré–Dulac normal form of the systems and examine the relationship between the normal form and integrability. Additionally, we introduce an efficient algorithm to determine the necessary conditions for the integrability of the systems. This algorithm is then applied to a quadratic subfamily of the systems to analyze its integrability and linearizability. Our findings offer insights into the integrability properties of three-dimensional polynomial systems.

References

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