

Non integrability of some Hamiltonians with rational potential

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Abstract

In this work we compute the families of classical Hamiltonians in two degrees of freedom in which the Normal Variational Equation around an invariant plane falls in Schrödinger type with polynomial or trigonometrical potential. In the first case we analyze the integrability of Normal Variational Equation in Liouvillian sense using the Kovacic's algorithm. We also introduce a method of algebrization that transforms equations with transcendental coefficients in equations with rational coefficients without changing the Galoisian structure of the equation. It allow us to deal with the second case via the universal covering of the cylinder. In both cases we obtain Galoisian obstructions to existence of a rational first integral of the original Hamiltonian via Morales-Ramis theory.