INTEGRABILITY OF HAMILTONIAN SYSTEMS WITH GYROSCOPIC TERM

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Abstract. We study the integrability of 2D Hamiltonian systems $H_\mu = \frac{1}{2}(p_1^2 + p_2^2) + \omega(p_1 q_2 - p_2 q_1) - \frac{\mu}{r} + V(q_1, q_2)$, where $r^2 = q_1^2 + q_2^2$, and potential $V(q_1, q_2)$ is a homogeneous rational function of degree k. The main result states that under very general assumptions: $\mu\omega \neq 0$, $|k| > 2$ and $V(1, \mathrm{i}) \neq 0$ or $V(-1, \mathrm{i}) \neq 0$, the system is not integrable. It was obtained by combining the Levi-Civita regularization, differential Galois methods and the so-called coupling constant metamorphosis transformation. The proof that the regularized version of the problem is not integrable contains the most important theoretical results, which can be applied to study integrability of other problems.

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