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Criteria to bound the number of critical periods

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Abstract

In the present paper we study the period function of centers of potential systems. We obtain criteria to bound the number of critical periods. In case that the system is polynomial, our result enables to tackle the problem from a purely algebraic point of view, since it allows to bound the number of critical periods by counting the zeros of a polynomial. To illustrate its applicability some new and old results are proved.

MSC: 34C07; 34C08; 34C23

Keywords: Center; Period function; Critical period; Chebyshev system

1. Introduction and statement of the main result

In this paper we study the period function of centers and we are interested in the case in which it is not monotone, i.e., the center has critical periods. To our knowledge, the key point in almost all the results appearing in the literature dealing with a family of centers with critical periods is that the period function satisfies some kind of Picard–Fuchs differential equation. Let us quote for instance the works of Yulin Zhao for two different families of quadratic centers [24,25] or the papers of Chow and Sanders [4] and Gavrilov [10] on the family of cubic potential centers.

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