

On persistent centers

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Abstract

For real planar autonomous analytic differential equations we introduce the notion of persistent center and show a list of equations with this property. We face the problem of whether our list is exhaustive or not and we prove that it is for several families of planar systems, like cubic or rigid systems.

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1. Introduction

The problem of distinguishing whether a monodromic critical point with imaginary eigenvalues of a family of planar analytical vector field is a center or a focus was already solved by Lyapunov. This problem is usually called *the center-focus problem*. The method consists in computing several quantities associated to the point, the so-called *Lyapunov constants*, and study whether they are zero or not. Without the aim of being exhaustive we quote some different methods addressed to compute them, collected according the approaches that they use: computation of a Lyapunov function, following the first method introduced by Lyapunov [3,13,19]; use of

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