



Simultaneous bifurcation of limit cycles from a linear center with extra singular points[☆]

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Abstract

The period annuli of the planar vector field $x' = -yF(x, y)$, $y' = xF(x, y)$, where the set $\{F(x, y) = 0\}$ consists of k different isolated points, is defined by $k + 1$ concentric annuli. In this paper we perturb it with polynomials of degree n and we study how many limit cycles bifurcate, up to a first order analysis, from all the period annuli simultaneously in terms of k and n . Additionally, we prove that the associated Abelian integral is piecewise rational and, when $k = 1$, the provided upper bound is reached. Finally, the case $k = 2$ is also treated.

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1. Introduction

Let H, f, g be polynomials in x, y such that $\gamma_h \subseteq \{H(x, y) = h\}$, with $h \in (h_0, h_1)$, are simple closed curves around the point $(x_0, y_0) = \gamma_{h_0}$. Then the system

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