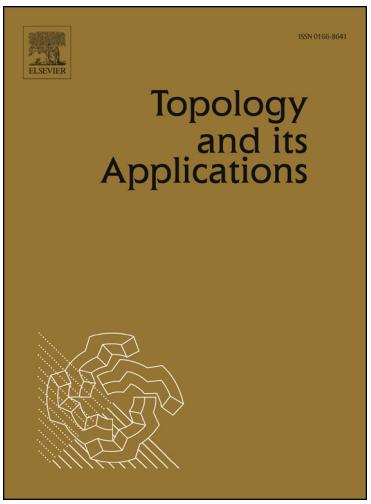

Phase portraits for some symmetric Riccati cubic polynomial differential equations

Jaume Llibre, Regilene Oliveira, Claudia Valls

PII: S0166-8641(17)30615-6
DOI: https://doi.org/10.1016/j.topol.2017.11.023
Reference: TOPOL 6325

To appear in: *Topology and its Applications*

Received date: 30 January 2017
Revised date: 29 May 2017
Accepted date: 17 July 2017

Please cite this article in press as: J. Llibre et al., Phase portraits for some symmetric Riccati cubic polynomial differential equations, *Topol. Appl.* (2017), https://doi.org/10.1016/j.topol.2017.11.023

Phase portraits for some symmetric Riccati cubic polynomial differential equations

Jaume Llibre[a], Regilene Oliveira[b], Claudia Valls[c]

[a] *Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Catalonia, Spain*
[b] *Departamento de Matemática, ICMC-Universidade de São Paulo, Avenida Trabalhador São-carlense, 400 - 13566-590, São Carlos, SP, Brazil*
[c] *Departamento de Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, Av. Rovisco Pais 1049–001, Lisboa, Portugal*

Abstract

We classify the topological phase portraits in the Poincaré disc of two classes of symmetric Riccati cubic polynomial differential systems .

Keywords: Riccati polynomial differential systems, vector fields, phase portrait, reversibility, equivariance.
2010 MSC: Primary 37J35, 37K10

1. Introduction and statement of the main results

The first works on Riccati equations appear in manuscripts of XVI–century by Count Riccati, who was mainly interested in studying the problem of separation of variables in quadratic and time-varying scalar systems, see [16]. Since then, in the subsequent centuries many contributions appeared regarding these equations. Nowadays it has been shown that Riccati differential equations appear in many applications such as in control, dynamic games, river flow, linear systems with Markovian jumps, invariant embedding, stochastic control theory, econometric models and diffusion problems (see for instance [2, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17]).

A Riccati differential equation is of the form

$$\frac{dy}{dx} = A(x)y^2 + B(x)y + C(x),$$

Email addresses: jllibre@mat.uab.cat (Jaume Llibre), regilene@icmc.usp.br (Regilene Oliveira), cvalls@math.ist.utl.pt (Claudia Valls)