

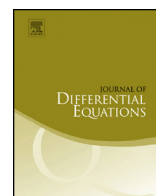


ELSEVIER

Contents lists available at ScienceDirect

Journal of Differential Equations

www.elsevier.com/locate/jde



Cyclicity of a simple focus via the vanishing multiplicity of inverse integrating factors [☆]

Isaac A. García ^{a,*}, Jaume Llibre ^b, Susanna Maza ^a

^a Departament de Matemàtica, Universitat de Lleida, Avda. Jaume II, 69, 25001 Lleida, Catalonia, Spain

^b Departament de Matemàtiques, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Catalonia, Spain

ARTICLE INFO

Article history:

Received 25 April 2012

Revised 24 May 2013

Available online 13 August 2013

MSC:

37G15

37G10

34C07

Keywords:

Focus

Center

Inverse integrating factor

Cyclicity of a focus

Limit cycles

Vanishing multiplicity

ABSTRACT

First we provide new properties about the vanishing multiplicity of the inverse integrating factor of a planar analytic differential system at a focus. After we use this vanishing multiplicity for studying the cyclicity of foci with pure imaginary eigenvalues and with homogeneous nonlinearities of arbitrary degree having either its radial or angular speed independent of the angle variable in polar coordinates. After we study the cyclicity of a class of nilpotent foci in their analytic normal form.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction and statement of the results

We consider planar differential systems

$$\dot{x} = P(x, y), \quad \dot{y} = Q(x, y), \quad (1)$$

[☆] The first and third authors are partially supported by a MINECO grant number MTM2011-22877 and by a CIRIT grant number 2009SGR 381. The second author is partially supported by a MINECO/FEDER grant number MTM2008-03437, by an AGAUR grant number 2009SGR 410, by ICREA Academia and by FP7-PEOPLE-2012-IRSES-316338 and 318999.

* Corresponding author.

E-mail addresses: garcia@matematica.udl.cat (I.A. García), jllibre@mat.uab.cat (J. Llibre), smaza@matematica.udl.cat (S. Maza).