Available online at www.sciencedirect.com

ScienceDirect

J. Differential Equations 262 (2017) 5773–5791

Journal of Differential Equations

www.elsevier.com/locate/jde

Restricted independence in displacement function for better estimation of cyclicity ☆

Xingwu Chen [a], Jaume Llibre [b], Zhaoxia Wang [c], Weinian Zhang [a,*]

[a] *Department of Mathematics, Sichuan University, Chengdu, Sichuan 610064, PR China*
[b] *Department de Matemàtique, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain*
[c] *School of Mathematical Sciences, University of Electronic Science and Technology of China, Chengdu, Sichuan 611731, PR China*

Received 6 June 2016; revised 7 February 2017

Abstract

Since the independence of focal values is a sufficient condition to give a number of limit cycles arising from a center-focus equilibrium, in this paper we consider a restricted independence to a parametric curve, which gives a method not only to increase the lower bound for the cyclicity of the center-focus equilibrium but also to be available when those focal values are not independent. We apply this method to a nondegenerate cubic center-focus variety and prove that the cyclicity reaches its an upper bound.

MSC: 34C07; 34C23

Keywords: Center-focus variety; Cyclicity; Focal value; Independence; Power sequence

☆ The author is partially supported by NSFC grant # 11471228 (X. Chen), a MINECO grant MTM2013-40998-P, an AGAUR grant number 2014SGR-568, and the grants FP7-PEOPLE-2012-IRSES 318999 and 316338 (J. Llibre), NSFC grant # 11501083 (Z. Wang), and NSFC grants # 11231001 and # 11521061 (W. Zhang).
* Corresponding author.
E-mail addresses: xingwu.chen@hotmail.com (X. Chen), jllibre@mat.uab.cat (J. Llibre), wzx_0909@163.com (Z. Wang), matzwn@126.com (W. Zhang).

http://dx.doi.org/10.1016/j.jde.2017.02.015