Limit cycles of polynomial differential systems of degree 1 and 2 on the cylinder

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Abstract

We consider planar polynomial differential systems of degree 1 and 2 on the cylinder and we study their limit cycles. We prove that such linear differential systems have at most one limit cycle and that such quadratic differential systems have at most two limit cycles. Moreover such upper bounds are reached.

Keywords Polynomial differential systems · Limit cycles · Normally hyperbolic

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1 Introduction and statement of the main results

The study of the limit cycles began with Poincaré, see [17]. The analysis of the existence of limit cycles and to know the maximum number of them in a differential system, attracted the interest of many researchers, mainly because their existence was observed in nature, see for instance [1, 10, 18]. Later on, it became the main object to be studied in the statement of the second part of the 16th Hilbert problem, which wants to find an upper bound for the maximum number of limit cycles that a polynomial differential system of a fixed degree can have, see [5–7]. Hence in the last years, the study of the limit cycles of

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