Publicacions Matemàtiques, Vol **40** (1996), 351–372.

NEW SUFFICIENT CONDITIONS FOR A CENTER AND GLOBAL PHASE PORTRAITS FOR POLYNOMIAL SYSTEMS

H. Giacomini and M. Ndiaye

Abstract

In this paper we consider cubic polynomial systems of the form: $\dot{x} = y + P(x, y)$, $\dot{y} = -x + Q(x, y)$, where P and Q are polynomials of degree 3 without linear part. If $M(x, y)$ is an integrating factor of the system, we propose its reciprocal $V(x, y) = \frac{1}{M(x,y)}$ as a linear function of certain coefficients of the system. We find in this way several new sets of sufficient conditions for a center. The resulting integrating factors are of Darboux type and the first integrals are in the Liouville form.

By induction, we have generalized these results for polynomials systems of arbitrary degree.

Moreover, for the cubic case, we have constructed all the phase portraits for each new family with a center.