

Normal forms, invariant manifolds and Lyapunov theorems

Henryk Żołądek
University of Warsaw

We present an approach to Lyapunov theorems about center for germs of analytic vector fields based on the Poincaré–Dulac and Birkhoff normal forms. Besides new proofs of three Lyapunov theorems we prove their generalization: if the Poincaré–Dulac normal form indicates the existence of a family of periodic solutions then such family really exists. We also present new proofs of Weinstein and Moser theorems about lower bounds for the number of families of periodic solutions; here, besides the normal forms, some topological tools are used, the Poincaré–Hopf formula and the Lusternik–Schnirelmann category on weighted projective spaces.