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Monotonous period function for equivariant differential equations with homogeneous nonlinearities

Real planar autonomous analytic differential systems can be written in complex coordinates in the compact form $\dot{z} = F(z, \overline{z})$, $z \in \mathbb{C}$. The $\mathbb{Z}_k$-equivariant differential equations are equations of this form that are invariant under a rotation through the angle $2\pi/k$ about the origin. For them, the phase portrait on each sector of width $2\pi/k$ centered at the origin is repeated k times. In this paper we are concerned with the simplest family of polynomial $\mathbb{Z}_k$-equivariant differential equations with a non-degenerated center at the origin and homogeneous nonlinearities

$$\dot{z} = iz + a(z\overline{z})^n z^{k+1}, \tag{1}$$

with n and k a positive integers and $0 \neq a \in \mathbb{C}$. The qualitative properties of the period function associated to the origin was posed as the 16th open problem in [A. Gasull. Some open problems in low dimensional dynamical systems. *SeMA Journal* **78** (2021) 233–269]. In particular, it is conjectured that it is monotonous decreasing. In this talk we give a positive answer to such conjecture. We show this result as corollary of proving that the period function of the center at the origin of a sub-family of the reversible quadratic centers is monotonous decreasing as well. The results presented in this talk can be found in [A. Gasull and D. Rojas. Monotonous period function for equivariant differential equations with homogeneous nonlinearities. *Mediterr. J. Math.* **22** (2025) 112].