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Chaotic behavior of the Lasota equation in Morrey spaces and applications to hematopoietic dynamics

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Abstract

This work investigates the asymptotic and dynamical behavior of the Lasota equation within Morrey spaces. We establish explicit criteria characterizing the stability and chaotic dynamics of the associated semigroup in the sense of Devaney. A critical threshold parameter separating stable and chaotic regimes is identified, extending classical results previously obtained in Lebesgue and Orlicz spaces.

The analysis demonstrates that the lack of separability in Morrey spaces does not prevent the existence of dense periodic orbits and topological transitivity. Moreover, we prove that the dynamical properties remain preserved for a more general Lasota-type equation with variable growth rate through topological conjugacy arguments.

Numerical simulations confirm the theoretical predictions and highlight faster convergence in Morrey spaces compared to classical Lebesgue spaces. These results provide a refined framework for modeling structured population dynamics and offer new perspectives for hematopoietic regulation modeling.

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