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9. Ordinary Differential Equations and Dynamical Systems

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Solution sets of problems with nonlinear functional boundary conditions

Plane sets are considered that arise as a result of parametrization of the set of solutions to a second-order boundary value problem with nonlinear functional boundary conditions that satisfy some monotonicity properties. Their topological structure is studied. The arcwise connectedness of the solution set is investigated. With the help of their retract properties, the sets are shown to be contractible. As they are acyclic, we can employ the Eilenberg-Montgomery fixed-point theorem to obtain the solvability for functional differential and ordinary differential equations. A similar type of boundary conditions arises in the theory of control and differential games.
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Reference: S. A. Brykalov, Properties of some plane sets, and boundary value problems, *Differential Equations* **31** (1995), 683–689.