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Topological Methods for Ordinary Differential Equations

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PREFACE

The topological degree is a fundamental tool for proving the existence of various kinds of solutions of nonlinear differential equations and for investigating the structure of such sets of solutions. Since the original classical work of Leray and Schauder, many authors have made contributions to the problem of extending the Leray-Schauder degree and applying it to new problems in analysis. These generalizations range from extensions of the Lefschetz fixed point theorem and the fixed point index on ANR's (manifolds and finite unions of convex sets providing important examples of ANR's) to the theory of parity of one parameter families of Fredholm operators, and from the theory of coincidence degree for mappings on Banach spaces to homotopy methods for continuation principles.

The motivation for a CIME session on these topics arose from the observation that very few of the CIME sessions which have been held over the years have been devoted to arguments related to Topological Methods in Analysis. We mention a session on Nonlinear Differential Equations (1964), one on Problems on Nonlinear Analysis (1970) and one on Bifurcation Theory and Applications (1983). However, since none of these previous sessions was entirely devoted to the growing field of topological methods in the theory of ordinary differential equations, the intention of this CIME session was to present the state of the art (at least for certain topological methods) and to provide a forum for discussion of the wide variety of mathematical tools which are involved.

Five CIME courses were given by well-known, active mathematicians with extensive experience in the application of topological methods to boundary value problems for ordinary differential equations. The texts for four of these courses are contained in this volume.

We are proud to have organized this CIME session, and we are grateful to the lecturers for their efforts at lucid exposition. We thank the Director and the staff of CIME for their support.

Massimo Furi, Pietro Zecca

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