

Preface

The present book is devoted to the study of differential equations. It is well known that to write a monograph or a textbook in a classical subject is a difficult enterprise requiring a rigorous selection of topics and exposition techniques. Part of mathematical analysis, the theory of differential equations is a fundamental discipline that carries a considerable weight in the professional development of mathematicians, physicists and engineers and, to a lesser extent, that of biologists and economists. Through its topics and investigative techniques, this discipline has a broad scope, touching diverse areas such as topology, functional analysis, mechanics, mathematical and theoretical physics, and differential geometry.

Although this book is structured around the main problems and results of the theory of ordinary differential equations, it contains several more recent results which have had a significant impact on research in this area. In fact, even when studying classical problems we have opted for techniques that highlight the functional methods and which are also applicable to evolution equations in infinite-dimensional spaces, thus smoothing the way towards a deeper understanding of the modern methods in the theory of partial differential equations.

We wrote this work bearing in mind the fact that differential equations represent, in truth, a branch of applied mathematics and that the vast majority of such equations have their origin in the mathematical modelling of phenomena in nature or society. We tried to offer the reader a large sample of such examples and applications in the hope that they will stimulate his interest and will provide a strong motivation for the study of this theory. Each chapter ends with a number of exercises and problems, theoretical or applied and of varying difficulty.

Since this book is not a treatise, and since we wanted to keep it within a reasonable size, we had to conscientiously omit several problems and subjects that are typically found in classical texts devoted to ordinary differential equations such as periodic systems of differential equations, Carathéodory solutions, delay-differential equations, differential equations on manifolds, and Sturm–Liouville problems. The willing reader can take up these topics at a later stage. In fact, the list of references contains the titles of several monographs or college textbooks that can substitute these omissions and complement the present book.

In closing, I would like to thank my colleagues Dr. Nicolae Luca and Dr. Gheorghe Morosanu, who read the manuscript and made pertinent comments that I took into account.

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