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Nota di contenuto	1 Banach Spaces and Fixed-Point Theorems -- 1.1 Linear Spaces and Dimension -- 1.2 Normed Spaces and Convergence -- 1.3 Banach Spaces and the Cauchy Convergence Criterion -- 1.4 Open and Closed Sets -- 1.5 Operators -- 1.6 The Banach Fixed-Point Theorem and the Iteration Method -- 1.7 Applications to Integral Equations -- 1.8 Applications to Ordinary Differential Equations -- 1.9 Continuity -- 1.10 Convexity -- 1.11 Compactness -- 1.12 Finite-Dimensional Banach Spaces and Equivalent Norms -- 1.13 The Minkowski Functional and Homeomorphisms -- 1.14 The Brouwer Fixed-Point Theorem -- 1.15 The Schauder Fixed-Point Theorem -- 1.16 Applications to Integral Equations -- 1.17 Applications to Ordinary Differential Equations -- 1.18 The Leray-Schauder Principle and a priori Estimates -- 1.19 Sub- and Supersolutions, and the Iteration Method in Ordered Banach Spaces -- 1.20 Linear Operators -- 1.21 The Dual Space -- 1.22 Infinite Series in Normed Spaces -- 1.23 Banach Algebras and Operator Functions -- 1.24 Applications to Linear Differential

Sommario/riassunto

A theory is the more impressive, the simpler are its premises, the more distinct are the things it connects, and the broader is its range of applicability. Albert Einstein There are two different ways of teaching mathematics, namely, (i) the systematic way, and (ii) the application-oriented way. More precisely, by (i), I mean a systematic presentation of the material governed by the desire for mathematical perfection and completeness of the results. In contrast to (i), approach (ii) starts out from the question "What are the most important applications?" and then tries to answer this question as quickly as possible. Here, one walks directly on the main road and does not wander into all the nice and interesting side roads. The present book is based on the second

approach. It is addressed to undergraduate and beginning graduate students of mathematics, physics, and engineering who want to learn how functional analysis elegantly solves mathematical problems that are related to our real world and that have played an important role in the history of mathematics. The reader should sense that the theory is being developed, not simply for its own sake, but for the effective solution of concrete problems. viii Preface This introduction to functional analysis is divided into the following two parts: Part I: Applications to mathematical physics (the present AMS Vol. 108); Part II: Main principles and their applications (AMS Vol. 109).