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Linear And Nonlinear Functional Analysis With Applications

PHILIPPE G. CIARLET

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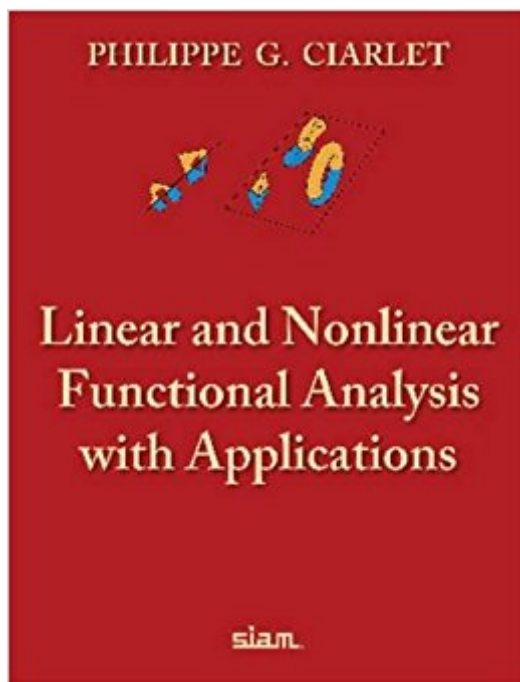
Synopsis

This single-volume textbook covers the fundamentals of linear and nonlinear functional analysis, illustrating most of the basic theorems with numerous applications to linear and nonlinear partial differential equations and to selected topics from numerical analysis and optimization theory. This book has pedagogical appeal because it features self-contained and complete proofs of most of the theorems, some of which are not always easy to locate in the literature or are difficult to reconstitute. It also offers 401 problems and 52 figures, plus historical notes and many original references that provide an idea of the genesis of the important results, and it covers most of the core topics from functional analysis. Audience: Linear and Nonlinear Functional Analysis with Applications is intended for advanced undergraduates, graduate students, and researchers and is ideal for teaching or self-study. Contents: Preface; Chapter 1: Real analysis and theory of functions: A quick review; Chapter 2: Normed vector spaces; Chapter 3: Banach spaces; Chapter 4: Inner-product spaces and Hilbert spaces; Chapter 5: The great theorems of linear functional analysis; Chapter 6: Linear partial differential equations; Chapter 7: Differential calculus in normed vector spaces; Chapter 8: Differential geometry in Rn; Chapter 9: The great theorems of nonlinear functional analysis; Bibliographical notes; Bibliography; Main notations; Index.

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Customer Reviews

A thorough and self-contained introduction to linear and nonlinear functional analysis, with applications to numerical analysis, optimisation, and partial differential equations. The book

presents a vast amount of foundational material, suitable for advanced undergraduates, along with historical notes, illustrations, and over 400 problems to help the reader explore the subject.

Philippe G. Ciarlet began his academic career at the UniversitÃƒÂ© Pierre et Marie Curie, Paris, in 1974, and moved to City University of Hong Kong in 2002. He is a member of eight academies, including the French Academy of Sciences and the Chinese Academy of Sciences and of the Hong Kong Institution of Science, and he is a Fellow of SIAM and the AMS. Ciarlet is the recipient of a Grand Prize from the French Academy of Sciences and a Humboldt Research Award, as well as many other awards. He is Doctor Honoris Causa, or Honorary Professor, at eight universities and the author of 190 research papers and 15 books.

HIGHLY recommended! Ciarlet does a masterful job of presenting all you need to know of linear and nonlinear analysis. Head and shoulders above other texts on the subject (but I must exclude Zeidler's fantastic, multi-volume treatment of functional analysis!). Proofs are clear and detailed, no "it is clear that..." handwaving. His treatment of diff calculus in a B-space setting is among the most readable I've seen. He even has a long chapter on diff geo in B-spaces. The focus is on hard analysis techniques, and maybe a bit less on general TVS theory, but that only makes the techniques stand out. (If you want some more generality, look at Zeidler's series, for example, to see homology used in functional analysis.).For example, in his proof of a generalized Implicit Function Theorem (pp. 548ff) he needs the fact that there is no retraction of the disk (in finitely many dimensions, of course) onto its boundary. He first shows there is no C^2 retraction, then he shows that, if a retraction exists, it has to be C^2!Problem sets are well-designed and help fill out the subject. I can't praise this masterpiece enough. There's enough material for a lifetime. Ciarlet has done a great service to students and researchers.

Very complete. Starts assuming you know almost nothing and constructs everything.

Very good

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