

<<实分析>>

图书基本信息

书名：<<实分析>>

13位ISBN编号：9787111313052

10位ISBN编号：7111313054

出版时间：2010-8

出版时间：机械工业出版社

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页数：505

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## 前言

The first three editions of H. Royden's Real Analysis have contributed to the education of generation so far from a theoretical analysis students. This fourth edition of Real Analysis preserves the goal and general structure of its venerable predecessors—to present the measure theory, integration theory, and functional analysis that a modern analyst needs to know. The book is divided into three parts: Part I treats Lebesgue measure and Lebesgue integration for functions of a single real variable; Part II treats abstract spaces topological spaces, metric spaces, Banach spaces, and Hilbert spaces; Part III treats integration over general measure spaces, together with the enrichments possessed by the general theory in the presence of topological, algebraic, or dynamical structure. The material in Parts II and III does not formally depend on Part I. However, a careful treatment of Part I provides the student with the opportunity to encounter new concepts in a familiar setting, which provides a foundation and motivation for the more abstract concepts developed in the second and third parts. Moreover, the Banach spaces created in Part I, the  $L_p$  spaces, are one of the most important classes of Banach spaces. The principal reason for establishing the completeness of the  $L_p$  spaces and the characterization of their dual spaces is to be able to apply the standard tools of functional analysis in the study of functionals and operators on these spaces. The creation of these tools is the goal of Part II.

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### 内容概要

《实分析（英文版·第4版）》是实分析课程的优秀教材，被国外众多著名大学（如斯坦福大学、哈佛大学等）采用。

全书分为三部分：第一部分为实变函数论.介绍一元实变函数的勒贝格测度和勒贝格积分.第二部分为抽象空间。

介绍拓扑空间、度量空间、巴拿赫空间和希尔伯特空间；第三部分为一般测度与积分理论。

介绍一般度量空间上的积分.以及拓扑、代数和动态结构的一般理论。

书中不仅包含数学定理和定义，而且还提出了富有启发性的问题，以便读者更深入地理解书中内容。

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作者简介

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## 书籍目录

Lebesgue Integration for Functions of a Single Real Variable Preliminaries on Sets, Mappings, and Relations Unions and Intersections of Sets Equivalence Relations, the Axiom of Choice, and Zorn's Lemma 1 The Real Numbers: Sets. Sequences, and Functions The Field, Positivity, and Completeness Axioms The Natural and Rational Numbers Countable and Uncountable Sets Open Sets, Closed Sets, and Borel Sets of Real Numbers Sequences of Real Numbers Continuous Real-Valued Functions of a Real Variable 2 Lebesgue Measure Introduction Lebesgue Outer Measure The  $\sigma$ -Algebra of Lebesgue Measurable Sets Outer and Inner Approximation of Lebesgue Measurable Sets Countable Additivity, Continuity, and the Borel-Cantelli Lemma Nonmeasurable Sets The Cantor Set and the Cantor Lebesgue Function 3 Lebesgue Measurable Functions Sums, Products, and Compositions Sequential Pointwise Limits and Simple Approximation Littlewood's Three Principles, Egoroff's Theorem, and Lusin's Theorem 4 Lebesgue Integration The Riemann Integral The Lebesgue Integral of a Bounded Measurable Function over a Set of Finite Measure The Lebesgue Integral of a Measurable Nonnegative Function The General Lebesgue Integral Countable Additivity and Continuity of Integration Uniform Integrability: The Vitali Convergence Theorem viii Contents 5 Lebesgue Integration: Further Topics Uniform Integrability and Tightness: A General Vitali Convergence Theorem Convergence in Measure Characterizations of Riemann and Lebesgue Integrability 6 Differentiation and Integration Continuity of Monotone Functions Differentiability of Monotone Functions: Lebesgue's Theorem Functions of Bounded Variation: Jordan's Theorem Absolutely Continuous Functions Integrating Derivatives: Differentiating Indefinite Integrals Convex Function 7 The  $L_p$  Spaces: Completeness and Approximation Normed Linear Spaces The Inequalities of Young, Hölder, and Minkowski  $L_p$  Is Complete: The Riesz-Fischer Theorem Approximation and Separability 8 The  $L_p$  Spaces: Duality and Weak Convergence The Riesz Representation for the Dual of Weak Sequential Convergence in  $L_p$  Weak Sequential Compactness The Minimization of Convex Functionals II Abstract Spaces: Metric, Topological, Banach, and Hilbert Spaces 9. Metric Spaces: General Properties Examples of Metric Spaces Open Sets, Closed Sets, and Convergent Sequences Continuous Mappings Between Metric Spaces Complete Metric Spaces Compact Metric Spaces Separable Metric Spaces 10 Metric Spaces: Three Fundamental Theorems The Arzelà-Ascoli Theorem The Baire Category Theorem The Banach Contraction Principle Topological Spaces: General Properties Open Sets, Closed Sets, Bases, and Subbases The Separation Properties Countability and Separability Continuous Mappings Between Topological Spaces Compact Topological Spaces Connected Topological Spaces 12 Topological Spaces: Three Fundamental Theorems Urysohn's Lemma and the Tietze Extension Theorem The Tychonoff Product Theorem The Stone-Weierstrass Theorem 13 Continuous Linear Operators Between Banach Spaces Normed Linear Spaces Linear Operators Compactness Lost: Infinite Dimensional Normed Linear Spaces The Open Mapping and Closed Graph Theorems The Uniform Boundedness Principle 14 Duality for Normed Linear Spaces Linear Functionals, Bounded Linear Functionals, and Weak Topologies The Hahn-Banach Theorem Reflexive Banach Spaces and Weak Sequential Convergence Locally Convex Topological Vector Spaces The Separation of Convex Sets and Mazur's Theorem The Krein-Milman Theorem 15 Compactness Regained: The Weak Topology Alaoglu's Extension of Heine's Theorem Reflexivity and Weak Compactness: Kakutani's Theorem Compactness and Weak Sequential Compactness: The Eberlein-Alaoglu Theorem Measurability of Weak Topologies 16 Continuous Linear Operators on Hilbert Spaces The Inner Product and Orthogonality The Dual Space and Weak Sequential Convergence Bessel's Inequality and Orthonormal Bases Adjoint and Symmetry for Linear Operators Compact Operators The Hilbert-Schmidt Theorem The Riesz-Schauder Theorem: Characterization of Fredholm Operators Measure and Integration: General Theory 17 General Measure Spaces: Their Properties and Construction Measures and Measurable Sets Signed Measures: The Hahn and Jordan Decompositions The Carathéodory Measure Induced by an Outer Measure 18 Integration General Measure Spaces 19 General  $L$  Spaces: Completeness, Duality and Weak Convergence 20 The Construction of Particular Measures 21 Measure and Topology 22 Invariant Measures Bibliography index



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### 编辑推荐

《实分析(英文版·第4版)》:新增了50%的习题。

扩充了基本结果。

包括给出叶果洛夫定理和乌雷松引理的证明。

介绍了博雷尔-坎特利引理、切比雪夫不等式、快速柯西序列及测度和积分所共有的连续性质,以及若干其他概念。



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