Remarks On Fuglede Putnam Theorem For Normal Operators

This book is an introductory text in functional analysis. Unlike many modern treatments, it begins with the particular and works its way to the more general. From the reviews: "This book is an excellent text for a first graduate course in functional analysis....Many interesting and important applications are included....It includes an abundance of exercises, and is written in the engaging and lucid style which we have come to expect from the author." --MATHEMATICAL REVIEWS

This volume contains solicited articles by speakers at the workshop ranging from expository surveys to original research papers, each of which carefully refereed. They all bear witness to the very rich mathematics that is connected with the study of elementary operators, may it be multivariable spectral theory, the invariant subspace problem or tensor products of C*-algebras.

In this paper, the authors study matrix functions of bounded type from the viewpoint of describing an interplay between function theory and operator theory. They first establish a criterion on the coprime-ness of two singular inner functions and obtain several properties of the Douglas-Shapiro-Shields factorizations of matrix functions of bounded type. They propose a new notion of tensored-scalar singularity, and then answer questions on Hankel operators with matrix-valued bounded type symbols. They also examine an interpolation problem related to a certain functional equation on matrix functions of bounded type; this can be seen as an extension of the classical Hermite-Fejér Interpolation Problem for matrix rational functions. The authors then extend the H?-functional calculus to an H?‾‾‾‾‾‾‾‾‾‾+H?-functional calculus for the compressions of the shift. Next, the authors consider the subnormality of Toeplitz operators with matrix-valued bounded type symbols and, in particular, the matrix-valued version of Halmos's Problem 5 and then establish a matrix-valued version of Abrahamse's Theorem. They also solve a subnormal Toeplitz completion problem of 2×2 partial block Toeplitz matrices. Further, they establish a characterization of hyponormal Toeplitz pairs with matrix-valued bounded type symbols and then derive rank formulae for the self-commutators of hyponormal Toeplitz pairs.

This book is a quick but precise and careful introduction to the subject of functional analysis. It covers the basic topics that can be found in a basic graduate analysis text. But it also covers more sophisticated topics such as spectral theory, convexity, and fixed-point theorems. A special feature of the book is that it contains a great many examples and even some applications. It concludes with a statement and proof of Lomonosov's dramatic result about invariant subspaces.

Clear, rigorous definitions of mathematical terms are crucial to good scientific and technical writing-and to understanding the writings of others. Scientists, engineers, mathematicians, economists, technical writers, computer programmers, along with teachers, professors, and students, all have the occasional-if not frequent-need for comprehensible, working definitions of mathematical expressions. To meet that need, CRC Press proudly introduces its Dictionary of Analysis, Calculus, and Differential Equations - the first published volume in the CRC Comprehensive Dictionary of Mathematics. More than three years in development, top academics and professionals from prestigious institutions around the world bring you more than 2,500 detailed definitions, written in a clear, readable style and complete with alternative meanings, and related references.

This volume comprises the proceedings of the Conference on Operator Theory and its Applications held in Gothenburg, Sweden, April 26-29, 2011. The conference was held in honour of Professor Victor Shulman on the occasion of his 65th birthday. The papers included in the volume cover a large variety of topics, among them the theory of operator ideals, linear preservers, C*-algebras, invariant subspaces, non-commutative harmonic analysis, and quantum groups, and reflect recent developments in these areas. The book consists of both original research papers and high quality survey articles, all of which were carefully refereed. ?

This textbook introduces spectral theory for bounded linear operators by focusing on (i) the spectral theory and functional calculus for normal operators acting on Hilbert spaces; (ii) the Riesz-Dunford functional calculus for Banach-space operators; and (iii) the Fredholm theory in both Banach and Hilbert spaces. Detailed proofs of all theorems are included and presented with precision and clarity, especially for the spectral theorems, allowing students to thoroughly familiarize themselves with all the important concepts. Covering both basic and more advanced material, the five chapters and two appendices of this volume provide a modern treatment on spectral theory. Topics range from spectral results on the Banach algebra of bounded linear operators acting on Banach spaces to functional calculus for Hilbert and Banach-space operators, including Fredholm and multiplicity theories. Supplementary propositions and further notes are included as well, ensuring a wide range of topics in spectral theory are covered. Spectral Theory of Bounded Linear Operators is ideal for graduate students in mathematics, and will also appeal to a wider audience of statisticians, engineers, and physicists. Though it is mostly self-contained, a familiarity with functional analysis, especially operator theory, will be helpful.

This self-contained work on Hilbert space operators takes a problem-solving approach to the subject, combining theoretical results with a wide variety of exercises that range from the straightforward to the state-of-the-art. Complete solutions to all problems are provided. The text covers the basics of bounded linear operators on a Hilbert space and gradually progresses to more advanced topics in spectral theory and quasireducible operators. Written in a motivating and rigorous style, the work has few prerequisites beyond elementary functional analysis, and will appeal to graduate students and researchers in mathematics, physics, engineering, and related disciplines.

Overall, this work combines together - in two volumes - four formally distinct topics of modern analysis and their applications: Hardy classes of holomorphic functions; spectral theory of Hankel and Toeplitz operators; function models for linear operators and free interpolations; and infinite-dimensional system theory and signal processing. This, the second volume, contains parts C and D of the whole.

From the Preface: "This book was written for the active reader. The first part consists of problems, frequently preceded by definitions and motivation, and sometimes followed by corollaries and historical remarks... The second part, a very short one, consists of hints... The third part, the longest, consists of solutions: proofs, answers, or contructions, depending on the nature of the problem.... This is not an introduction to Hilbert space theory. Some knowledge of that subject is a prerequisite: at the very least, a study of the elements of Hilbert space theory should proceed concurrently with the reading of this book."

Each chapter in this book describes relevant background theory followed by specialized results. Hundreds of identitites, inequalities, and matrix facts are stated clearly with cross references, citations to the literature, and illuminating remarks.

Complex Proofs of Real Theorems is an extended meditation on Hadamard's famous dictum, ``The shortest and best way between two truths of the real domain often passes through the imaginary one." Directed at an audience acquainted with analysis at the first year graduate level, it aims at illustrating how complex variables can be used to provide quick and efficient proofs of a wide variety of important results in such areas of analysis as approximation theory, operator theory, harmonic analysis, and complex dynamics. Topics discussed include weighted approximation on the line, Muntz's theorem, Toeplitz operators, Beurling's theorem on the invariant spaces of the shift operator, prediction theory, the Riesz convexity theorem, the Paley-Wiener theorem, the Titchmarsh convolution theorem, the Gleason-Kahane-Zelazko theorem, and the Fatou-Julia-Baker theorem. The discussion begins with the world's shortest proof of the fundamental theorem of algebra and concludes with Newman's almost effortless proof

of the prime number theorem. Four brief appendices provide all necessary background in complex analysis beyond the standard first year graduate course. Lovers of analysis and beautiful proofs will read and reread this slim volume with pleasure and profit.
This work is a concise introduction to spectral theory of Hilbert space operators. Its emphasis is on recent aspects of theory and detailed proofs, with the primary goal of offering a modern introductory textbook for a first graduate course in the subject. The coverage of topics is thorough, as the book explores various delicate points and hidden features often left untreated. Spectral Theory of Operators on Hilbert Spaces is addressed to an interdisciplinary audience of graduate students in mathematics, statistics, economics, engineering, and physics. It will also be useful to working mathematicians using spectral theory of Hilbert space operators, as well as for scientists wishing to apply spectral theory to their field. ?
Elementary Operators and Their Applications3rd International Workshop held at Queen's University Belfast, 14-17 April 2009Springer Science & Business Media
This book is dedicated to the spectral theory of linear operators on Banach spaces and of elements in Banach algebras. It presents a survey of results concerning various types of spectra, both of single and n-tuples of elements. Typical examples are the one-sided spectra, the approximate point, essential, local and Taylor spectrum, and their variants. Many results appear here for the first time in a monograph.
An introductory exposition of the study of operator theory, presenting an interesting and rapid approach to some results which are not normally treated in an introductory source. The volume includes recent results and coverage of the current state of the field. {\it Elements of Operatory Theory} is aimed at graduate students as well as a new generation of mathematicians and scientists who need to apply operator theory to their field. Written in a user-friendly, motivating style, fundamental topics are presented in a systematic fashion, i.e., set theory, algebraic structures, topological structures, Banach spaces, Hilbert spaces, culminating with the Spectral Theorem, one of the landmarks in the theory of operators on Hilbert spaces. The exposition is concept-driven and as much as possible avoids the formula-computational approach. Key features of this largely self-contained work include: * required background material to each chapter * fully rigorous proofs, over 300 of them, are specially tailored to the presentation and some are new * more than 100 examples and, in several cases, interesting counterexamples that demonstrate the frontiers of an important theorem * over 300 problems, many with hints * both problems and examples underscore further auxiliary results and extensions of the main theory; in this non-traditional framework, the reader is challenged and has a chance to prove the principal theorems anew This work is an excellent text for the classroom as well as a self-study resource for researchers. Prerequisites include an introduction to analysis and to functions of a complex variable, which most first-year graduate students in mathematics, engineering, or another formal science have already acquired. Measure theory and integration theory are required only for the last section of the final chapter.
The book discusses the complete proof of the Brown-Douglas-Fillmore theorem along with a number of its applications.
By a Hilbert-space operator we mean a bounded linear transformation be tween separable complex Hilbert spaces. Decompositions and models for Hilbert-space operators have been very active research topics in operator theory over the past three decades. The main motivation behind them is the in variant subspace problem: does every Hilbert-space operator have a nontrivial invariant subspace? This is perhaps the most celebrated open question in op erator theory. Its relevance is easy to explain: normal operators have invariant subspaces (witness: the Spectral Theorem), as well as operators on finite dimensional Hilbert spaces (witness: canonical Jordan form). If one agrees that each of these (i. e. the Spectral Theorem and canonical Jordan form) is important enough an achievement to dismiss any further justification, then the search for nontrivial invariant subspaces is a natural one; and a recalcitrant one at that. Subnormal operators have nontrivial invariant subspaces (extending the normal branch), as well as compact operators (extending the finite-dimensional branch), but the question remains unanswered even for equally simple (i. e. simple to define) particular classes of Hilbert-space operators (examples: hyponormal and quasinilpotent operators). Yet the invariant subspace quest has certainly not been a failure at all, even though far from being settled. The search for nontrivial invariant subspaces has undoubtly yielded a lot of nice results in operator theory, among them, those concerning decompositions and models for Hilbert-space operators. This book contains nine chapters.
This second of two volumes gives a modern exposition of the theory of Banach algebras.
Modern theory of elliptic operators, or simply elliptic theory, has been shaped by the Atiyah-Singer Index Theorem created 40 years ago. Reviewing elliptic theory over a broad range, 32 leading scientists from 14 different countries present recent developments in topology; heat kernel techniques; spectral invariants and cutting and pasting; noncommutative geometry; and theoretical particle, string and membrane physics, and Hamiltonian dynamics. The first of its kind, this volume is ideally suited to graduate students and researchers interested in careful expositions of newly-evolved achievements and perspectives in elliptic theory. The contributions are based on lectures presented at a workshop acknowledging Krzysztof P Wojciechowski''s work in the theory of elliptic operators. Sample Chapter(s). Contents (42 KB). Contents: On the Mathematical Work of Krzysztof P Wojciechowski: Selected Aspects of the Mathematical Work of Krzysztof P Wojciechowski (M Lesch); Gluing Formulae of Spectral Invariants and Cauchy Data Spaces (J Park); Topological Theories: The Behavior of the Analytic Index under Nontrivial Embedding (D Bleecker); Critical Points of Polynomials in Three Complex Variables (L I Nicolaescu); Chern-Weil Forms Associated with Superconnections (S Paycha & S Scott); Heat Kernel Calculations and Surgery: Non-Laplace Type Operators on Manifolds with Boundary (I G Avramidi); Eta Invariants for Manifold with Boundary (X Dai); Heat Kernels of the Sub-Laplacian and the Laplacian on Nilpotent Lie Groups (K Furutani); Remarks on Nonlocal Trace Expansion Coefficients (G Grubb); An Anomaly Formula for L 2- Analytic Torsions on Manifolds with Boundary (X Ma & W Zhang); Conformal Anomalies via Canonical Traces (S Paycha & S Rosenberg); Noncommutative Geometry: An Analytic Approach to Spectral Flow in von Neumann Algebras (M-T Benameur et al.); Elliptic Operators on Infinite Graphs (J Dodziuk); A New Kind of Index Theorem (R G Douglas); A Note on Noncommutative Holomorphic and Harmonic Functions on the Unit Disk (S Klimek); Star Products and Central Extensions (J Mickelsson); An Elementary Proof of the Homotopy Equivalence between the Restricted General Linear Group and the Space of Fredholm Operators (T Wurzbacher); Theoretical Particle, String and Membrane Physics, and Hamiltonian Dynamics: T-Duality for Non-Free Circle Actions (U Bunke & T Schick); A New Spectral Cancellation in Quantum Gravity (G Esposito et al.); A Generalized Morse Index Theorem (C Zhu). Readership: Researchers in modern global analysis and particle physics.
Most books on linear operators are not easy to follow for students and researchers without an extensive background in mathematics. Self-contained and using only matrix theory, Invitation to Linear Operators: From Matricies to Bounded Linear Operators on a Hilbert Space explains in easy-to-follow steps a variety of interesting recent results on linear operators on a Hilbert

space. The author first states the important properties of a Hilbert space, then sets out the fundamental properties of bounded linear operators on a Hilbert space. The final section presents some of the more recent developments in bounded linear operators. Together with the companion volume by the same author, Operators, Functions, and Systems: An Easy Reading. Volume 1: Hardy, Hankel, and Toeplitz, Mathematical Surveys and Monographs, Vol. 92, AMS, 2002, this unique work combines four major topics of modern analysis and its applications: A. Hardy classes of holomorphic functions, B. Spectral theory of Hankel and Toeplitz operators, C. Function models for linear operators and free interpolations, and D. Infinite-dimensional system theory and signal processing. This volume contains Parts C and D. Function models for linear operators and free interpolations: This is a universal topic and, indeed, is the most influential operator theory technique in the post-spectral-theorem era. In this book, its capacity is tested by solving generalized Carleson-type interpolation problems. Infinite-dimensional system theory and signal processing: This topic is the touchstone of the three previously developed techniques. The presence of this applied topic in a pure mathematics environment reflects important changes in the mathematical landscape of the last 20 years, in that the role of the main consumer and customer of harmonic, complex, and operator analysis has more and more passed from differential equations, scattering theory, and probability to control theory and signal processing. This and the companion volume are geared toward a wide audience of readers, from graduate students to professional mathematicians. They develop an elementary approach to the subject while retaining an expert level that can be applied in advanced analysis and selected applications.

Linear algebra and matrix theory are fundamental tools in mathematical and physical science, as well as fertile fields for research. This second edition of this acclaimed text presents results of both classic and recent matrix analysis using canonical forms as a unifying theme and demonstrates their importance in a variety of applications. This thoroughly revised and updated second edition is a text for a second course on linear algebra and has more than 1,100 problems and exercises, new sections on the singular value and CS decompositions and the Weyr canonical form, expanded treatments of inverse problems and of block matrices, and much more.

This book offers an account of a number of aspects of operator theory, mainly developed since the 1980s, whose problems have their roots in quantum theory. The research presented is in non-commutative operator approximation theory or, to use Halmos' terminology, in operator approximants. Focusing on the concept of approximants, this self-contained book is suitable for graduate courses.

This book covers topics appropriate for a first-year graduate course preparing students for the doctorate degree. The first half of the book presents the core of measure theory, including an introduction to the Fourier transform. This material can easily be covered in a semester. The second half of the book treats basic functional analysis and can also be covered in a semester. After the basics, it discusses linear transformations, duality, the elements of Banach algebras, and C*-algebras. It concludes with a characterization of the unitary equivalence classes of normal operators on a Hilbert space. The book is self-contained and only relies on a background in functions of a single variable and the elements of metric spaces. Following the author's belief that the best way to learn is to start with the particular and proceed to the more general, it contains numerous examples and exercises.

'In a certain sense, subnormal operators were introduced too soon because the theory of function algebras and rational approximation was also in its infancy and could not be properly used to examine this class of operators. The progress in the theory of subnormal operators that has come about during the last several years grew out of applying the results of rational approximation' - from the Preface.This book is the successor to the author's 1981 book on the same subject. In addition to reflecting the great strides in the development of subnormal operator theory since the first book, the present work is oriented toward rational functions rather than polynomials. Although the book is a research monograph, it has many of the traits of a textbook, including exercises. The book requires background in function theory and functional analysis, but is otherwise fairly self-contained. The first few chapters cover the basics about subnormal operator theory and present a study of analytic functions on the unit disk. Other topics included are: some results on hyponormal operators, an exposition of rational approximation interspersed with applications to operator theory, a study of weak-star rational approximation, a set of results that can be termed structure theorems for subnormal operators, and a proof that analytic bounded point evaluations exist.

General Theory of C*-Algebras

A second course in linear algebra for undergraduates in mathematics, computer science, physics, statistics, and the biological sciences.

Provides the fundamentals of representations of finitely presented *-algebras by bounded operators. The theory is illustrated with numerous examples of *-algebra. The examples, in particular, include *-algebra with two self-adjoint generators that satisfy a quadratic or a more general relation, *-algebra with three or four generators, *-algebra that arise from one- and many-dimensional discrete dynamical systems. Wick *-algebra various; *-wild algebras. This book is intended for graduate students as well as researchers.

This book pursues the accurate study of the mathematical foundations of Quantum Theories. It may be considered an introductory text on linear functional analysis with a focus on Hilbert spaces. Specific attention is given to spectral theory features that are relevant in physics. Having left the physical phenomenology in the background, it is the formal and logical aspects of the theory that are privileged. Another not lesser purpose is to collect in one place a number of useful rigorous statements on the mathematical structure of Quantum Mechanics, including some elementary, yet fundamental, results on the Algebraic Formulation of Quantum Theories. In the attempt to reach out to Master's or PhD students, both in physics and mathematics, the material is designed to be self-contained: it includes a summary of point-set topology and abstract measure theory, together with an appendix on differential geometry. The book should benefit established researchers to organise and present the profusion of advanced material disseminated in the literature. Most chapters are accompanied by exercises, many of which are solved explicitly.