Singular Differential And Integral Equations With Applications 1st Edition

In the last century many problems which arose in the science, engineer ing and technology literature involved nonlinear complex phenomena. In many situations these natural phenomena give rise to (i). ordinary differ ential equations which are singular in the independent and/or dependent variables together with initial and boundary conditions, and (ii). Volterra and Fredholm type integral equations. As one might expect general exis tence results were difficult to establish for the problems which arose. Indeed until the early 1990's only very special examples were examined and these examples were usually tackled using some special device, which was usually only applicable to the particular problem under investigation. However in the 1990's new results in inequality and fixed point theory were used to present a very general existence theory for singular problems. This mono graph presents an up to date account of the literature on singular problems. One of our aims also is to present recent theory on singular differential and integral equations to a new and wider audience. The book presents a compact, thorough, and self-contained account for singular problems. An important feature of this book is that we illustrate how easily the theory can be applied to discuss many real world examples of current interest. In Chapter 1 we study differential equations which are singular in the independent variable. We begin with

some standard notation in Section 1. 2 and introduce LP-Caratheodory functions. Some fixed point theorems, the Arzela- Ascoli theorem and Banach's theorem are also stated here.

In this volume, we report new results about various theories and methods of integral equation, boundary value problems for partial differential equations and functional equations, and integral operators including singular integral equations, applications of boundary value problems and integral equations to mechanics and physics, numerical methods of integral equations and boundary value problems, theories and methods for inverse problems of mathematical physics, Clifford analysis and related problems. Contents:Some Properties of a Kind of Singular Integral Operator for K-Monogenic Function in Clifford Analysis (L P Wang, Z L Xu and Y Y Qiao)Some Results Related with Möbius Transformation in Clifford Analysis (Z X Zhang)The Scattering of SH Wave on the Array of Periodic Cracks in a Piezoelectric Substrate Bonded a Half-Plane of Functionally Graded Materials (J Q Liu, X Li, S Z Dong, X Y Yao and C F Wang)Anti-Plane Problem of Two Collinear Cracks in a Functionally Graded Coating–Substrate Structure (S H Ding and X Li)A Kind of Riemann Boundary Value Problem for Triharmonic Functions in Clifford Analysis (L F Gu)A New Dynamical Systems Method for Nonlinear Operator Equations (X J Luo, F C Li and S H Yang)A Class of Integral Inequality and Application (W S Wang)An Efficient Spectral Boundary Integral Equation Method for the Simulation of Earthquake Rupture Problems (W S Wang and B W

Zhang)High-Frequency Asymptotics for the Modified Helmholtz Equation in a Half-Plane (H M Huang)An Inverse Boundary Value Problem Involving Filtration for Elliptic Systems of Equations (Z L Xu and L Yan)Fixed Point Theorems of Contractive Mappings in Extended Cone Metric Spaces (H P Huang and X Li)Positive Solutions of Singular Third-Order Three-Point Boundary Value Problems (B Q Yan and X Liu)Modified Neumann Integral and Asymptotic Behavior in the Half-Space (Y H Zhang, G T Deng and Z Z Wei)Piecewise Tikhonov Regularization Scheme to Reconstruct Discontinuous Density in Computerized Tomography (J Cheng, Y Jiang, K Lin and J W Yan)About the Quaternionic Jacobian Conjecture (H Liu)Interaction Between Antiplane Circular Inclusion and Circular Hole of Piezoelectric Materials (L H Chang and X Li)Convergence of Numerical Algorithm for Coupled Heat and Mass Transfer in Textile Materials (M B Ge, J X Cheng and D H Xu)Haversian Cortical Bone with a Radial Microcrack (X Wang)Spectra of Unitary Integral Operators on L2(?) with Kernels k(xy) (D W Ma and G Chen)The Numerical Simulation of Long-Period Ground Motion on Basin Effects (Y Q Li and X Li)Complete Plane Strain Problem of a One-Dimensional Hexagonal Quasicrystals with a Doubly-Periodic Set of Cracks (X Li and P P Shi)The Problem About an Elliptic Hole with III Asymmetry Cracks in One-Dimensional Hexagonal Piezoelectric Quasicrystals (H S Huo and X Li)The Second Fundamental Problem of Periodic Plane Elasticity of a One-Dimensional Hexagonal Quasicrystals (J Y Cui, P P Shi and X Li)The Optimal Convex Combination Bounds for the Centroidal

Mean (H Liu and X J Meng)The Method of Fundamental Solution for a Class of Elliptical Partial Differential Equations with Coordinate Transformation and Image Technique (L N Wu and Q Jiang)Various Wavelet Methods for Solving Fractional Fredholm–Volterra Integral Equations (P P Shi, X Li and X Li) Readership: Researchers in analysis and differential equations. Keywords:Integral Equations;Boundary Value ProblemsKey Features:Provides new research progress on these topics

In 1979, I edited Volume 18 in this series: Solution Methods for Integral Equations: Theory and Applications. Since that time, there has been an explosive growth in all aspects of the numerical solution of integral equations. By my estimate over 2000 papers on this subject have been published in the last decade, and more than 60 books on theory and applications have appeared. In particular, as can be seen in many of the chapters in this book, integral equation techniques are playing an increas ingly important role in the solution of many scientific and engineering problems. For instance, the boundary element method discussed by Atkinson in Chapter 1 is becoming an equal partner with finite element and finite difference techniques for solving many types of partial differential equations. Obviously, in one volume it would be impossible to present a complete picture of what has taken place in this area during the past ten years. Consequently, we have chosen a number of subjects in which significant advances have been made that we feel have not been covered in depth in other books. For instance, ten years ago the theory of the numerical solution of Cauchy singular

equations was in its infancy. Today, as shown by Golberg and Elliott in Chapters 5 and 6, the theory of polynomial approximations is essentially complete, although many details of practical implementation remain to be worked out.

The book is devoted to varieties of linear singular integral equations, with special emphasis on their methods of solution. It introduces the singular integral equations and their applications to researchers as well as graduate students of this fascinating and growing branch of applied mathematics.

Lucid, self-contained exposition of theory of ordinary differential equations and integral equations. Boundary value problem of second order linear ordinary differential equations, Fredholm integral equations, many other topics. Bibliography. 1960 edition.

The book deals with linear integral equations, that is, equations involving an unknown function which appears under the integral sign and contains topics such as Abel's integral equation, Volterra integral equations, Fredholm integral integral equations, singular and nonlinear integral equations, orthogonal systems of functions, Green's function as a symmetric kernel of the integral equations.

Many physical problems that are usually solved by differential equation methods can be solved more effectively by integral equation methods. Such problems abound in applied mathematics, theoretical mechanics, and mathematical physics. The second edition of this widely used book continues the emphasis on applications and presents a variety of techniques with extensive examples. Additional material has been added throughout the book. The chapters dealing with differential equations and singular integral equations have been expanded considerably. Thus

the book is ideal as a text for a beginning graduate level course. Its treatment of boundary value problems and an extended and up-to-date bibliography will also make the book useful to research workers in many applied fields.

In this undergraduate/graduate textbook, the authors introduce ODEs and PDEs through 50 class-tested lectures. Mathematical concepts are explained with clarity and rigor, using fully worked-out examples and helpful illustrations. Exercises are provided at the end of each chapter for practice. The treatment of ODEs is developed in conjunction with PDEs and is aimed mainly towards applications. The book covers important applications-oriented topics such as solutions of ODEs in form of power series, special functions, Bessel functions, hypergeometric functions, orthogonal functions and polynomials, Legendre, Chebyshev, Hermite, and Laguerre polynomials, theory of Fourier series. Undergraduate and graduate students in mathematics, physics and engineering will benefit from this book. The book assumes familiarity with calculus.

Considers the class of singular integral equations on bounded two-dimensional multiply connected domains on the plane, and their applications to the theory of general elliptic systems of partial differential equations.

Singular Differential and Integral Equations with ApplicationsSpringer Science & Business Media

This monograph provides a complete and self-contained account of the theory, methods, and applications of constant-sign solutions of integral equations. In particular, the focus is on different systems of Volterra and Fredholm equations. The presentation is systematic and the material is broken down into several concise chapters. An introductory chapter covers the

basic preliminaries. Throughout the book many examples are included to illustrate the theory. The book contains a wealth of results that are both deep and interesting. This unique book will be welcomed by mathematicians working on integral equations, spectral theory, and on applications of fixed point theory and boundary value problems.

In analysing nonlinear phenomena many mathematical models give rise to problems for which only nonnegative solutions make sense. In the last few years this discipline has grown dramatically. This state-of-the-art volume offers the authors' recent work, reflecting some of the major advances in the field as well as the diversity of the subject. Audience: This volume will be of interest to graduate students and researchers in mathematical analysis and its applications, whose work involves ordinary differential equations, finite differences and integral equations.

Many physical problems that are usually solved by differential equation methods can be solved more effectively by integral equation methods. Such problems abound in applied mathematics, theoretical mechanics, and mathematical physics. This uncorrected soft cover reprint of the second edition places the emphasis on applications and presents a variety of techniques with extensive examples.Originally published in 1971, Linear Integral Equations is ideal as a text for a beginning graduate level course. Its treatment of boundary value problems also makes the book useful to researchers in many applied fields.

This concise and classic volume presents the main results of integral equation theory as consequences of the theory of operators on Banach and Hilbert spaces. In addition, it offers a brief account of Fredholm's original approach. The self-contained treatment requires only some familiarity with elementary real variable theory, including the elements of Lebesgue integration,

and is suitable for advanced undergraduates and graduate students of mathematics. Other material discusses applications to second order linear differential equations, and a final chapter uses Fourier integral techniques to investigate certain singular integral equations of interest for physical applications as well as for their own sake. A helpful index concludes the text.

This book presents the subject of integral equations in an accessible manner for a variety of applications. Emphasis is placed on understanding the subject while avoiding the abstract and compact theorems. A distinctive feature of the book is that it introduces the recent powerful and reliable developments in this field, which are not covered in traditional texts. The newly developed decomposition method, the series solution method and the direct computation method are thoroughly implemented, which allows the topic to be far more accessible. The book also includes some of the traditional techniques for comparison.Using the newly developed methods, the author successfully handles Fredholm and Volterra integral equations, singular integral equations, integro-differential equations and nonlinear integral equations, with promising results for linear and nonlinear models. Many examples are given to introduce the material in a clear and thorough fashion. In addition, many exercises are provided to build confidence, ease and skill in using the new methods.This book may be used as a text for advanced undergraduates and graduate students in mathematics and scientific areas, and as a work of reference for research study of differential equations and numerical analysis.

The present book deals with the finite-part singular integral equations, the multidimensional singular integral equations and the non-linear singular integral equations, which are currently used in many fields of engineering mechanics with applied character, like elasticity, plasticity, thermoelastoplasticity, viscoelasticity, viscoplasticity, fracture mechanics, structural analysis,

fluid mechanics, aerodynamics and elastodynamics. These types of singular integral equations form the latest high technology on the solution of very important problems of solid and fluid mechanics and therefore special attention should be given by the reader of the present book, who is interested for the new technology of the twentieth-one century. Chapter 1 is devoted with a historical report and an extended outline of References, for the finite-part singular integral equations, the multidimensional singular integral equations and the non-linear singular integral equations. Chapter 2 provides a finite-part singular integral representation analysis in Lp spaces and in general Hilbert spaces. In the same Chapter are investigated all possible approximation methods for the numerical evaluation of the finite-part singular integral equations, as closed form solutions for the above type of integral equations are available only in simple cases. Also, Chapter 2 provides further a generalization of the well known Sokhotski-Plemelj formulae and the Nother theorems, for the case of a finite-part singular integral equation.

Linear and Nonlinear Integral Equations: Methods and Applications is a self-contained book divided into two parts. Part I offers a comprehensive and systematic treatment of linear integral equations of the first and second kinds. The text brings together newly developed methods to reinforce and complement the existing procedures for solving linear integral equations. The Volterra integral and integro-differential equations, the Fredholm integral and integro-differential equations, the Volterra-Fredholm integral equations, singular and weakly singular integral equations, and systems of these equations, are handled in this part by using many different computational schemes. Selected worked-through examples and exercises will guide readers through the text. Part II provides an extensive exposition on the nonlinear integral

equations and their varied applications, presenting in an accessible manner a systematic treatment of ill-posed Fredholm problems, bifurcation points, and singular points. Selected applications are also investigated by using the powerful Padé approximants. This book is intended for scholars and researchers in the fields of physics, applied mathematics and engineering. It can also be used as a text for advanced undergraduate and graduate students in applied mathematics, science and engineering, and related fields. Dr. Abdul-Majid Wazwaz is a Professor of Mathematics at Saint Xavier University in Chicago, Illinois, USA. Transmutations, Singular and Fractional Differential Equations with Applications to Mathematical Physics connects difficult problems with similar more simple ones. The book's strategy works for differential and integral equations and systems and for many theoretical and applied problems in mathematics, mathematical physics, probability and statistics, applied computer science and numerical methods. In addition to being exposed to recent advances, readers learn to use transmutation methods not only as practical tools, but also as vehicles that deliver theoretical insights. Presents the universal transmutation method as the most powerful for solving many problems in mathematics, mathematical physics, probability and statistics, applied computer science and numerical methods Combines mathematical rigor with an illuminating exposition full of historical notes and fascinating details Enables researchers, lecturers and students to find material under the single "roof"

The proceedings covers the following topics: Boundary value problems of partial differential equations including free boundary problems; Theory and methods of integral equations including singular integral equations; Applications of integral

equations and boundary value problems to mechanics and physics; and numerical methods for integral equations and boundary value problems. This second edition integrates the newly developed methods with classical techniques to give both modern and powerful approaches for solving integral equations. It provides a comprehensive treatment of linear and nonlinear Fredholm and Volterra integral equations of the first and second kinds. The materials are presented in an accessible and straightforward manner to readers, particularly those from non-mathematics backgrounds. Numerous well-explained applications and examples as well as practical exercises are presented to guide readers through the text. Selected applications from mathematics, science and engineering are investigated by using the newly developed methods. This volume consists of nine chapters, pedagogically organized, with six chapters devoted to linear integral equations, two chapters on nonlinear integral equations, and the last chapter on applications. It is intended for scholars and researchers, and can be used for advanced undergraduate and graduate students in applied mathematics, science and engineering. Click here for solutions manual. This book is the result of 20 years of investigations carried out by the author and his colleagues in order to bring closer and, to a certain extent, synthesize a number of well-known results, ideas and methods from the theory of function

approximation, theory of differential and integral equations and numerical analysis. The book opens with an introduction on the theory of function approximation and is followed by a new approach to the Fredholm integral equations to the second kind. Several chapters are devoted to the construction of new methods for the effective approximation of solutions of several important integral, and ordinary and partial differential equations. In addition, new general results on the theory of linear differential equations with one regular singular point, as well as applications of the various new methods are discussed. The present edition differs from the original German one mainly in the following addi tional material: weighted norm inequalities for maximal functions and singular opera tors (§ 12, Chap. XI), polysingular integral operators and pseudo-differential operators (§§ 7, 8, Chap. XII), and spline approximation methods for solving singular integral equations (§ 4, Chap. XVII). Furthermore, we added two subsections on polynomial approximation methods for singular integral equations over an interval or with dis continuous coefficients (Nos. 3.6 and 3.7, Chap. XVII). In many places we incorporated new results which, in the vast majority, are from the last five years after publishing the German edition (note that the references are enlarged by about 150 new titles). S. G. Mikhlin wrote §§ 7, 8, Chap. XII, and the other additions were drawn up by S. Prossdorf. We wish to express our

deepest gratitude to Dr. A. Bottcher and Dr. R. Lehmann who together translated the text into English carefully and with remarkable expertise.

Ordinary differential equations serve as mathematical models for many exciting real world problems. Rapid growth in the theory and applications of differential equations has resulted in a continued interest in their study by students in many disciplines. This textbook organizes material around theorems and proofs, comprising of 42 class-tested lectures that effectively convey the subject in easily manageable sections. The presentation is driven by detailed examples that illustrate how the subject works. Numerous exercise sets, with an "answers and hints" section, are included. The book further provides a background and history of the subject.

The final aim of the book is to construct effective discretization methods to solve multidimensional weakly singular integral equations of the second kind on a region of Rn e.g. equations arising in the radiation transfer theory. To this end, the smoothness of the solution is examined proposing sharp estimates of the growth of the derivatives of the solution near the boundary G. The superconvergence effect of collocation methods at the collocation points is established. This is a book for graduate students and researchers in the fields of analysis, integral equations, mathematical physics and numerical methods. No

special knowledge beyond standard undergraduate courses is assumed.
/homepage/sac/cam/na2000/index.html7-Volume Set now available at special set price ! This volume contains contributions in the area of differential equations and integral equations. Many numerical methods have arisen in response to the need to solve "real-life" problems in applied mathematics, in particular problems that do not have a closed-form solution. Contributions on both initial-value problems and boundary-value problems in ordinary differential equations appear in this volume. Numerical methods for initial-value problems in ordinary differential equations fall naturally into two classes: those which use one starting value at each step (one-step methods) and those which are based on several values of the solution (multistep methods). John Butcher has supplied an expert's perspective of the development of numerical methods for ordinary differential equations in the 20th century. Rob Corless and Lawrence Shampine talk about established technology, namely software for initial-value problems using Runge-Kutta and Rosenbrock methods, with interpolants to fill in the solution between mesh-points, but the 'slant' is new - based on the question, "How should such software integrate into the current generation of Problem Solving Environments?" Natalia Borovykh and Marc Spijker study the problem of establishing upper bounds for the norm of the nth power of square matrices. The dynamical system viewpoint has been of great benefit to ODE theory and numerical methods. Related is the study of chaotic behaviour. Willy Govaerts discusses the numerical methods for the computation and continuation of equilibria and bifurcation points of equilibria of dynamical systems. Arieh Iserles and Antonella Zanna survey the construction of Runge-Kutta methods which preserve algebraic invariant functions. Valeria Antohe and Ian Gladwell present numerical experiments on solving a Hamiltonian system of Hénon and Heiles

with a symplectic and a nonsymplectic method with a variety of precisions and initial conditions. Stiff differential equations first became recognized as special during the 1950s. In 1963 two seminal publications laid to the foundations for later development: Dahlquist's paper on A-stable multistep methods and Butcher's first paper on implicit Runge-Kutta methods. Ernst Hairer and Gerhard Wanner deliver a survey which retraces the discovery of the order stars as well as the principal achievements obtained by that theory. Guido Vanden Berghe, Hans De Meyer, Marnix Van Daele and Tanja Van Hecke construct exponentially fitted Runge-Kutta methods with s stages. Differential-algebraic equations arise in control, in modelling of mechanical systems and in many other fields. Jeff Cash describes a fairly recent class of formulae for the numerical solution of initial-value problems for stiff and differential-algebraic systems. Shengtai Li and Linda Petzold describe methods and software for sensitivity analysis of solutions of DAE initial-value problems. Again in the area of differential-algebraic systems, Neil Biehn, John Betts, Stephen Campbell and William Huffman present current work on mesh adaptation for DAE two-point boundary-value problems. Contrasting approaches to the question of how good an approximation is as a solution of a given equation involve (i) attempting to estimate the actual error (i.e., the difference between the true and the approximate solutions) and (ii) attempting to estimate the defect - the amount by which the approximation fails to satisfy the given equation and any side-conditions. The paper by Wayne Enright on defect control relates to carefully analyzed techniques that have been proposed both for ordinary differential equations and for delay differential equations in which an attempt is made to control an estimate of the size of the defect. Many phenomena incorporate noise, and the numerical solution of stochastic differential equations has developed as a relatively

new item of study in the area. Keven Burrage, Pamela Burrage and Taketomo Mitsui review the way numerical methods for solving stochastic differential equations (SDE's) are constructed. One of the more recent areas to attract scrutiny has been the area of differential equations with after-effect (retarded, delay, or neutral delay differential equations) and in this volume we include a number of papers on evolutionary problems in this area. The paper of Genna Bocharov and Fathalla Rihan conveys the importance in mathematical biology of models using retarded differential equations. The contribution by Christopher Baker is intended to convey much of the background necessary for the application of numerical methods and includes some original results on stability and on the solution of approximating equations. Alfredo Bellen, Nicola Guglielmi and Marino Zennaro contribute to the analysis of stability of numerical solutions of nonlinear neutral differential equations. Koen Engelborghs, Tatyana Luzyanina, Dirk Roose, Neville Ford and Volker Wulf consider the numerics of bifurcation in delay differential equations. Evelyn Buckwar contributes a paper indicating the construction and analysis of a numerical strategy for stochastic delay differential equations (SDDEs). This volume contains contributions on both Volterra and Fredholm-type integral equations. Christopher Baker responded to a late challenge to craft a review of the theory of the basic numerics of Volterra integral and integro-differential equations. Simon Shaw and John Whiteman discuss Galerkin methods for a type of Volterra integral equation that arises in modelling viscoelasticity. A subclass of boundary-value problems for ordinary differential equation comprises eigenvalue problems such as Sturm-Liouville problems (SLP) and Schrödinger equations. Liviu Ixaru describes the advances made over the last three decades in the field of piecewise perturbation methods for the numerical solution of Sturm-Liouville

problems in general and systems of Schrödinger equations in particular. Alan Andrew surveys the asymptotic correction method for regular Sturm-Liouville problems. Leon Greenberg and Marco Marletta survey methods for higher-order Sturm-Liouville problems. R. Moore in the 1960s first showed the feasibility of validated solutions of differential equations, that is, of computing guaranteed enclosures of solutions. Boundary integral equations. Numerical solution of integral equations associated with boundary-value problems has experienced continuing interest. Peter Junghanns and Bernd Silbermann present a selection of modern results concerning the numerical analysis of one-dimensional Cauchy singular integral equations, in particular the stability of operator sequences associated with different projection methods. Johannes Elschner and Ivan Graham summarize the most important results achieved in the last years about the numerical solution of one-dimensional integral equations of Mellin type of means of projection methods and, in particular, by collocation methods. A survey of results on quadrature methods for solving boundary integral equations is presented by Andreas Rathsfeld. Wolfgang Hackbusch and Boris Khoromski present a novel approach for a very efficient treatment of integral operators. Ernst Stephan examines multilevel methods for the h-, p- and hp- versions of the boundary element method, including pre-conditioning techniques. George Hsiao, Olaf Steinbach and Wolfgang Wendland analyze various boundary element methods employed in local discretization schemes.

Recent results on partial differential equations as well as with complex analytic methods on singular integral equations and on related subjects are presented. Many of the contributions are survey articles. Topics ranging from elliptic, parabolic, hyperbolic, and mixed-type equations and systems to hyper-complex and quatern ionic analysis, M-analytic, bianalytic,

polyharmonic and functions of several complex variables are covered. Applications to mathematical physics are also included. Audience: Specialists in partial differential equations and related topics, with an interest in real and complex methods and in applications to mathematical physics will find this book very useful.

Many mathematical problems in science and engineering are defined by ordinary or partial differential equations with appropriate initial-boundary conditions. Among the various methods, boundary integral equation method (BIEM) is probably the most effective. It's main advantage is that it changes a problem from its formulation in terms of unbounded differential operator to one for an integral/integro-differential operator, which makes the problem tractable from the analytical or numerical point of view. Basically, the review/study of the problem is shifted to a boundary (a relatively smaller domain), where it gives rise to integral equations defined over a suitable function space. Integral equations with singular kernels areamong the most important classes in the fields of elasticity, fluid mechanics, electromagnetics and other domains in applied science and engineering. With the advancesin computer technology, numerical simulations have become important tools in science and engineering. Several methods have been developed in numerical analysis for equations in mathematical models of applied sciences. Widely used methods include: Finite Difference Method (FDM), Finite Element Method (FEM), Finite Volume Method (FVM) and Galerkin Method (GM). Unfortunately, none of these are versatile. Each has merits and limitations. For example, the widely used FDM and FEM suffers from difficulties in problem solving when rapid changes appear in singularities. Even with the modern computing machines, analysis of shock-wave or crack propagations in three dimensional solids by the existing classical numerical schemes is challenging

(computational time/memory requirements). Therefore, with the availability of faster computing machines, research into the development of new efficient schemes for approximate solutions/numerical simulations is an ongoing parallel activity. Numerical methods based on wavelet basis (multiresolution analysis) may be regarded as a confluence of widely used numerical schemes based on Finite Difference Method, Finite Element Method, Galerkin Method, etc. The objective of this monograph is to deal with numerical techniques to obtain (multiscale) approximate solutions in wavelet basis of different types of integral equations with kernels involving varieties of singularities appearing in the field of elasticity, fluid mechanics, electromagnetics and many other domains in applied science and engineering.

This volume of the Proceedings of the congress ISAAC '97 collects the con tributions of the four sections 1. Function theoretic and functional analytic methods for pde, 2. Applications of function theory of several complex variables to pde, 3. Integral equations and boundary value problems, 4. Partial differential equations. Most but not all of the authors have participated in the congress. Unfortunately some from Eastern Europe and Asia have not managed to come because of lack of financial support. Nevertheless their manuscripts of the proposed talks are included in this volume. The majority of the papers deal with complex methods. Among them boundary value problems in particular the Riemann-Hilbert, the Riemann (Hilbert) and related problems are treated. Boundary behaviour of vector-valued functions are studied too. The Riemann-Hilbert problem is solved for elliptic complex equations, for mixed complex equations, and for several complex variables. It is considered in a general topological setting for mappings into q;n and related to Toeplitz operators. Convolution operators are investigated for nilpotent Lie groups leading to some consequences for the null space of the tangential Cauchy Riemann

operator. Some boundary value problems for overdetermined systems in balls of q;n are solved explicitly. A survey is given for the Gauss-Manin connection associated with deformations of curve singularities. Several papers deal with generalizations of analytic functions with various applications to mathematical physics. Singular integrals in quaternionic anal ysis are studied which are applied to the time-harmonic Maxwell equations.

Many physical problems that are usually solved by differential equation techniques can be solved more effectively by integral equation methods. This work focuses exclusively on singular integral equations and on the distributional solutions of these equations. A large number of beautiful mathematical concepts are required to find such solutions, which in tum, can be applied to a wide variety of scientific fields - potential theory, me chanics, fluid dynamics, scattering of acoustic, electromagnetic and earth quake waves, statistics, and population dynamics, to cite just several. An integral equation is said to be singular if the kernel is singular within the range of integration, or if one or both limits of integration are infinite. The singular integral equations that we have studied extensively in this book are of the following type. In these equations f (x) is a given function and g(y) is the unknown function. 1. The Abel equation x x) = l g (y) d 0