Elementary Theory Of Analytic Functions Of One Or Several Complex Variables

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"This book is the first volume of a two-volume textbook for undergraduates and is indeed the crystallization of a course offered by the author at the California Institute of Technology to undergraduates without any previous knowledge of number theory. For this reason, the book starts with the most elementary properties of the natural integers. Nevertheless, the text succeeds in presenting an enormous amount of material in little more than 300 pages."-—MATHEMATICAL REVIEWS

This valuable book focuses on a collection of powerful methods of analysis that yield deep number-theoretical estimates. Particular attention is given to counting functions of prime numbers and multiplicative arithmetic functions. Both real variable (?elementary?) and complex variable (?analytic?) methods are employed. The reader is assumed to have knowledge of elementary number theory (abstract algebra will also do) and real and complex analysis. Specialized analytic techniques, including transform and Tauberian methods, are developed as needed.Comments and corrigenda for the book are found at http: //www.math.uiuc.edu/ diamond/

This book is intended as a textbook for a first course in the theory of functions of one complex variable for students who are mathematically mature enough to understand and execute E - I) arguments. The actual pre requisites for reading this book are quite minimal; not much more than a stiff course in basic calculus and a few facts about partial derivatives. The topics from advanced calculus that are used (e.g., Leibniz's rule for differ entiating under the integral sign) are proved in detail. Complex Variables is a subject which has something for all mathematicians. In addition to having applications to other parts of analysis, it can rightly claim to be an ancestor of many areas of mathematics (e.g., homotopy theory, manifolds). This view of Complex Analysis as "An Introduction to Mathe matics" has influenced the writing and selection of subject matter for this book. The other guiding principle followed is that all definitions, theorems, etc.

This text on complex variables is geared toward graduate students and undergraduates who have taken an introductory course in real analysis. It is a substantially revised and updated edition of the popular text by Robert B. Ash, offering a concise treatment that provides careful and complete explanations as well as numerous problems and solutions. An introduction presents basic definitions, covering topology of the plane, analytic functions, real-differentiability and the Cauchy-Riemann equations, and exponential and harmonic functions. Succeeding chapters examine the elementary theory and the general Cauchy theorem and its applications, including singularities, residue theory, the open mapping theorem for analytic functions, linear fractional transformations, conformal mapping, and analytic mappings of one disk to another. The Riemann mapping theorem receives a thorough treatment, along with factorization of analytic functions. As an application of many of the ideas and results appearing in earlier chapters, the text ends with a proof of the prime number theorem.

Reprint of the original, first published in 1899.

The subjects treated in this book have been especially chosen to represent a bridge connecting the content of a first course on the elementary theory of analytic functions with a rigorous treatment of some of the most important special functions: the Euler gamma function, the Gauss hypergeometric function, and the Kummer confluent hypergeometric function. Such special functions are indispensable tools in "higher calculus" and are frequently encountered in almost all branches of pure and applied mathematics. The only knowledge assumed on the part of the reader is an understanding of basic concepts to the level of an elementary course covering the residue theorem, Cauchy's integral formula, the Taylor and Laurent series expansions, poles and essential singularities, branch points, etc. The book addresses the needs of advanced undergraduate and graduate students in mathematics or physics.

The purpose of this book is to present the classical analytic function theory of several variables as a standard subject in a course of mathematics after learning the elementary materials (sets, general topology, algebra, one complex variable). This includes the essential parts of Grauert–Remmert's two volumes, GL227(236) (Theory of Stein spaces) and GL265 (Coherent analytic sheaves) with a lowering of the level for novice graduate students (here, Grauert's direct image theorem is limited to the case of finite maps).The core of the theory is "Oka's Coherence", found and proved by Kiyoshi Oka. It is indispensable, not only in the study of complex analysis and complex geometry, but also in a large area of modern mathematics. In this book, just after an introductory chapter on holomorphic functions (Chap. 1), we prove Oka's First Coherence Theorem for holomorphic functions in Chap. 2. This defines a unique character of the book compared with other books on this subject, in which the notion of coherence appears much later.The present book, consisting of nine chapters, gives complete treatments of the following items: Coherence of sheaves of holomorphic functions (Chap. 2); Oka–Cartan's Fundamental Theorem (Chap. 4); Coherence of ideal sheaves of complex analytic subsets (Chap. 6); Coherence of the normalization sheaves of complex spaces (Chap. 6); Grauert's Finiteness Theorem (Chaps. 7, 8); Oka's Theorem for Riemann domains (Chap. 8). The theories of sheaf cohomology and domains of holomorphy are also presented (Chaps. 3, 5). Chapter 6 deals with the theory of complex analytic subsets. Chapter 8 is devoted to the applications of formerly obtained results, proving Cartan–Serre's Theorem and Kodaira's Embedding Theorem. In Chap. 9, we discuss the historical development of "Coherence".It is difficult to find a book at this level that treats all of the above subjects in a completely self-contained manner. In the present volume, a number of classical proofs are improved and simplified, so that the contents are easily accessible for beginning graduate students.

Basic treatment includes existence theorem for solutions of differential systems where data is analytic, holomorphic functions, Cauchy's integral, Taylor and Laurent expansions, more. Exercises. 1973 edition.

The book examines in some depth two important classes of point processes, determinantal processes and ``Gaussian zeros'', i.e., zeros of random analytic functions with Gaussian coefficients. These processes share a property of ``point-repulsion'', where distinct points are less likely to fall close to each other than in processes, such as the Poisson process, that arise from independent sampling. Nevertheless, the treatment in the book emphasizes the use of independence: for random power series, the independence of coefficients is key; for determinantal processes, the number of points in a domain is a sum of independent indicators, and this yields a satisfying explanation of the central limit theorem (CLT) for this point count. Another unifying theme of the book is invariance of considered point processes under natural transformation groups. The book strives for balance between general theory and concrete examples. On the one hand, it presents a primer on modern techniques on the interface of probability and analysis. On the other hand, a wealth of determinantal processes of intrinsic interest are analyzed; these arise from random spanning trees and eigenvalues of random matrices, as well as from special power series with determinantal zeros. The material in the book formed the basis of a graduate course given at the IAS-Park City Summer School in 2007; the only background knowledge assumed can be acquired in first-year graduate courses in analysis and probability.

Shorter version of Markushevich's Theory of Functions of a Complex Variable, appropriate for advanced undergraduate and graduate courses in complex analysis. More than 300 problems, some with hints and answers. 1967 edition.

This volume contains a collection of papers in Analytic and Elementary Number Theory in memory of Professor Paul Erdös, one of the greatest mathematicians of this century. Written by many leading researchers, the papers deal with the most recent advances in a wide variety of topics, including arithmetical functions, prime numbers, the Riemann zeta function, probabilistic number theory, properties of integer sequences, modular forms, partitions, and q-series. Audience: Researchers and students of number theory, analysis, combinatorics and modular forms will find this volume to be stimulating.

One of the most authoritative and comprehensive books on the subject of continued fractions, this monograph has been widely used by generations of mathematicians and their students. Dr. Hubert Stanley Wall presents a unified theory correlating certain parts and applications of the subject within a larger analytic structure. Prerequisites include a first course in function theory and knowledge of the elementary properties of linear transformations in the complex plane. Some background in number theory, real analysis, and complex analysis may also prove helpful. The two-part treatment begins with an exploration of convergence theory, addressing continued fractions as products of linear fractional transformations, convergence theorems, and the theory of positive definite continued fractions, as well as other topics. The second part, focusing on function theory, covers the theory of equations, matrix theory of continued fractions, bounded analytic functions, and many additional subjects.

Functions of a complex variable are used to solve applications in various branches of mathematics, science, and engineering. Functions of a Complex Variable: Theory and Technique is a book in a special category of influential classics because it is based on the authors' extensive experience in modeling complicated situations and providing analytic solutions. The book makes available to readers a comprehensive range of these analytical techniques based upon complex variable theory. Advanced topics covered include asymptotics, transforms, the Wiener-Hopf method, and dual and singular integral equations. The authors provide many exercises, incorporating them into the body of the text. Audience: intended for applied mathematicians, scientists, engineers, and senior or graduate-level students who have advanced knowledge in calculus and are interested in such subjects as complex variable theory, function theory, mathematical methods, advanced engineering mathematics, and mathematical physics.

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The study of composition operators lies at the interface of analytic function theory and operator theory. Composition Operators on Spaces of Analytic Functions synthesizes the achievements of the past 25 years and brings into focus the broad outlines of the developing theory. It provides a comprehensive introduction to the linear operators of composition with a fixed function acting on a space of analytic functions. This new book both highlights the unifying ideas behind the major theorems and contrasts the differences between results for related spaces. Nine chapters introduce the main analytic techniques needed, Carleson measure and other integral estimates, linear fractional models, and kernel function techniques, and demonstrate their application to problems of boundedness, compactness, spectra, normality, and so on, of composition operators. Intended as a graduate-level textbook, the prerequisites are minimal. Numerous exercises illustrate and extend the theory. For students and non-students alike, the exercises are an integral part of the book. By including the theory for both one and several variables, historical notes, and a comprehensive bibliography, the book leaves the reader well grounded for future research on composition operators and related areas in operator or function theory.

Analytic Number Theory distinguishes itself by the variety of tools it uses to establish results. One of the primary attractions of this theory is its vast diversity of concepts and methods. The main goals of this book are to show the scope of the theory, both in classical and modern directions, and to exhibit its wealth and prospects, beautiful theorems, and powerful techniques. The book is written with graduate students in mind, and the authors nicely balance clarity, completeness, and generality. The exercises in each section serve dual purposes, some intended to improve readers' understanding of the subject and others providing additional information. Formal prerequisites for the major part of the book do not go beyond calculus, complex analysis, integration, and Fourier series and integrals. In later chapters automorphic forms become important, with much of the necessary information about them included in two survey chapters.

At almost all academic institutions worldwide, complex variables and analytic functions are utilized in courses on applied mathematics, physics, engineering, and other related subjects. For most students, formulas alone do not provide a sufficient introduction to this widely taught material, yet illustrations of functions are sparse in current books on the topic. This is the first primary introductory textbook on complex variables and analytic functions to make extensive use of functional illustrations. Aiming to reach undergraduate students entering the world of complex variables and analytic functions, this book utilizes graphics to visually build on familiar cases and illustrate how these same functions extend beyond the real axis. It covers several important topics that are omitted in nearly all recent texts, including techniques for analytic continuation and discussions of elliptic functions and of Wiener–Hopf methods. It also presents current advances in research, highlighting the subject’s active and fascinating frontier. The primary audience for this textbook is undergraduate students taking an introductory course on complex variables and analytic functions. It is also geared toward graduate students taking a second semester course on these topics, engineers and physicists who use complex variables in their work, and students and researchers at any level who want a reference book on the subject.

An Introduction to Complex Analysis and Geometry provides the reader with a deep appreciation of complex analysis and how this subject fits into mathematics. The book developed from courses given in the Campus Honors Program at the University of Illinois Urbana-Champaign. These courses aimed to share with students the way many mathematics and physics problems magically simplify when viewed from the perspective of complex analysis. The book begins at an elementary level but also contains advanced material. The first four chapters provide an introduction to complex analysis with many elementary and unusual applications. Chapters 5 through 7 develop the Cauchy theory and include some striking applications to calculus. Chapter 8 glimpses several appealing topics, simultaneously unifying the book and opening the door to further study. The 280 exercises range from simple computations to difficult problems. Their variety makes the book especially attractive. A reader of the first four chapters will be able to apply complex numbers in many elementary contexts. A reader of the full book will know basic one complex variable theory and will have seen it integrated into mathematics as a whole. Research mathematicians will discover several novel perspectives.

This problem book gathers together 15 problem sets on analytic number theory that can be profitably approached by anyone from advanced high school students to those pursuing graduate studies. It emerged from a 5-week course taught by the first author as part of the 2019 Ross/Asia Mathematics Program held from July 7 to August 9 in Zhenjiang, China. While it is recommended that the reader has a solid background in mathematical problem solving (as from training for mathematical contests), no possession of advanced subject-matter knowledge is assumed. Most of the solutions require nothing more than elementary number theory and a good grasp of calculus. Problems touch at key topics like the value-distribution of arithmetic functions, the distribution of prime numbers, the distribution of squares and nonsquares modulo a prime number, Dirichlet's theorem on primes in arithmetic progressions, and more. This book is suitable for any student with a special interest in developing problem-solving skills in analytic number theory. It will be an invaluable aid to lecturers and students as a supplementary text for introductory Analytic Number Theory courses at both the undergraduate and graduate level.

Differential Galois theory is an important, fast developing area which appears more and more in graduate courses since it mixes fundamental objects from many different areas of mathematics in a stimulating context. For a long time, the dominant approach, usually called Picard-Vessiot Theory, was purely algebraic. This approach has been extensively developed and is well covered in the literature. An alternative approach consists in tagging algebraic objects with transcendental information which enriches the understanding and brings not only new points of view but also new solutions. It is very powerful and can be applied in situations where the Picard-Vessiot approach is not easily extended. This book offers a hands-on transcendental approach to differential Galois theory, based on the Riemann-Hilbert correspondence. Along the way, it provides a smooth, down-to-earth introduction to algebraic geometry, category theory and tannakian duality. Since the book studies only complex analytic linear differential equations, the main prerequisites are complex function theory, linear algebra, and an elementary knowledge of groups and of polynomials in many variables. A large variety of examples, exercises, and theoretical constructions, often via explicit computations, offers first-year graduate students an accessible entry into this exciting area.

The Kernel Function and Conformal Mapping by Stefan Bergman is a revised edition of ""The Kernel Function"". The author has made extensive changes in the original volume. The present book will be of interest not only to mathematicians, but also to engineers, physicists, and computer scientists. The applications of orthogonal functions in solving boundary value problems and conformal mappings onto canonical domains are discussed; and publications are indicated where programs for carrying out numerical work using high-speed computers can be found.The unification of methods in the theory of functions of one and several complex variables is one of the purposes of introducing the kernel function and the domains with a distinguished boundary. This approach has been extensively developed during the last two decades. This second edition of Professor Bergman's book reviews this branch of the theory including recent developments not dealt with in the first edition. The presentation of the topics is simple and presupposes only knowledge of an elementary course in the theory of analytic functions of one variable.

With this second volume, we enter the intriguing world of complex analysis. From the first theorems on, the elegance and sweep of the results is evident. The starting point is the simple idea of extending a function initially given for real values of the argument to one that is defined when the argument is complex. From there, one proceeds to the main properties of holomorphic functions, whose proofs are generally short and quite illuminating: the Cauchy theorems, residues, analytic continuation, the argument principle. With this background, the reader is ready to learn a wealth of additional material connecting the subject with other areas of mathematics: the Fourier transform treated by contour integration, the zeta function and the prime number theorem, and an introduction to elliptic functions culminating in their application to combinatorics and number theory. Thoroughly developing a subject with many ramifications, while striking a careful balance between conceptual insights and the technical underpinnings of rigorous analysis, Complex Analysis will be welcomed by students of mathematics, physics, engineering and other sciences. The Princeton Lectures in Analysis represents a sustained effort to introduce the core areas of mathematical analysis while also illustrating the organic unity between them. Numerous examples and applications throughout its four planned volumes, of which Complex Analysis is the second, highlight the far-reaching consequences of certain ideas in analysis to other fields of mathematics and a variety of sciences. Stein and Shakarchi move from an introduction addressing Fourier series and integrals to in-depth considerations of complex analysis; measure and integration theory, and Hilbert spaces; and, finally, further topics such as functional analysis, distributions and elements of probability theory.

The theory of analytic functions of several complex variables enjoyed a period of remarkable development in the middle part of the twentieth century. After initial successes by Poincare and others in the late 19th and early 20th centuries, the theory encountered obstacles that prevented it from growing quickly into an analogue of the theory for functions of one complex variable. Beginning in the 1930s, initially through the work of Oka, then H. Cartan, and continuing with the work of Grauert, Remmert, and others, new tools were introduced into the theory of several complex variables that resolved many of the open problems and fundamentally changed the landscape of the subject. These tools included a central role for sheaf theory and increased uses of topology and algebra. The book by Gunning and Rossi was the first of the modern era of the theory of several complex variables, which is distinguished by the use of these methods. The intention of Gunning and Rossi's book is to provide an extensive introduction to the Oka-Cartan theory and some of its applications, and to the general theory of analytic spaces. Fundamental concepts and techniques are discussed as early as possible. The first chapter covers material suitable for a one-semester graduate course, presenting many of the central problems and techniques, often in special cases. The later chapters give more detailed expositions of sheaf theory for analytic functions and the theory of complex analytic spaces. Since its original publication, this book has become a classic resource for the modern approach to functions of several complex variables and the theory of analytic spaces. Further information about this book, including updates, can be found at the following URL: www.ams.org/bookpages/chel-368.

Complex Variables deals with complex variables and covers topics ranging from Cauchy's theorem to entire functions, families of analytic functions, and the prime number theorem. Major applications of the basic principles, such as residue theory, the Poisson integral, and analytic continuation are given. Comprised of seven chapters, this book begins with an introduction to the basic definitions and concepts in complex variables such as the extended plane, analytic and elementary functions, and Cauchy-Riemann equations. The first chapter defines the integral of a complex function on a path in the complex plane and develops the machinery to prove an elementary version of Cauchy's theorem. Some

applications, including the basic properties of power series, are then presented. Subsequent chapters focus on the general Cauchy theorem and its applications; entire functions; families of analytic functions; and the prime number theorem. The geometric intuition underlying the concept of winding number is emphasized. The linear space viewpoint is also discussed, along with analytic number theory, residue theory, and the Poisson integral. This book is intended primarily for students who are just beginning their professional training in mathematics.
Over 1500 problems on theory of functions of the complex variable; coverage of nearly every branch of classical function theory. Topics include conformal mappings, integrals and power series, Laurent series, parametric integrals, integrals of the Cauchy type, analytic continuation, Riemann surfaces, much more. Answers and solutions at end of text. Bibliographical references. 1965 edition.
An elementary but detailed insight into the theory of L-functions. The presentation is self contained and concise.
The notes that eventually became this book were written between 1977 and 1985 for the course called Constructive Combinatorics at the University of Minnesota. This is a one-quarter (10 week) course for upper level undergraduate students. The class usually consists of mathematics and computer science majors, with an occasional engineering student. Several graduate students in computer science also attend. At Minnesota, Constructive Combinatorics is the third quarter of a three quarter sequence. The fIrst quarter, Enumerative Combinatorics, is at the level of the texts by Bogart [Bo], Brualdi [Br], Liu [Li] or Tucker [Tu] and is a prerequisite for this course. The second quarter, Graph Theory and Optimization, is not a prerequisite. We assume that the students are familiar with the techniques of enumeration: basic counting principles, generating functions and inclusion/exclusion. This course evolved from a course on combinatorial algorithms. That course contained a mixture of graph algorithms, optimization and listing algorithms. The computer assignments generally consisted of testing algorithms on examples. While we felt that such material was useful and not without mathematical content, we did not think that the course had a coherent mathematical focus. Furthermore, much of it was being taught, or could have been taught, elsewhere. Graph algorithms and optimization, for instance, were inserted into the graph theory course where they naturally belonged. The computer science department already taught some of the material: the simpler algorithms in a discrete mathematics course; effIciency of algorithms in a more advanced course.
"This book presents a basic introduction to complex analysis in both an interesting and a rigorous manner. It contains enough material for a full year's course, and the choice of material treated is reasonably standard and should be satisfactory for most first courses in complex analysis. The approach to each topic appears to be carefully thought out both as to mathematical treatment and pedagogical presentation, and the end result is a very satisfactory book." --MATHSCINET
When first published in 1959, this book was the basis of a two-semester course in complex analysis for upper undergraduate and graduate students. J. S. Mac Nerney was a proponent of the Socratic, or “do-it-yourself” method of learning mathematics, in which students are encouraged to engage in mathematical problem solving, including theorems at every level which are often regarded as “too difficult” for students to prove for themselves. Accordingly, Mac Nerney provides no proofs. What he does instead is to compose and arrange the investigation in his own unique style, so that a contextual proof is always available to the persistent student who enjoys a challenge. The central idea is to empower students by allowing them to discover and rely on their own mathematical abilities. This text may be used in a variety of settings, including: the usual classroom or seminar, but with the teacher acting mainly as a moderator while the students present their discoveries, a small-group setting in which the students present their discoveries to each other, and independent study. The Editors, William E. Kaufman (who was Mac Nerney’s last PhD student) and Ryan C. Schwiebert, have composed the original typed Work into LaTeX ; they have updated the notation, terminology, and some of the prose for modern usage, but the organization of content has been strictly preserved. About this Book, some new exercises, and an index have also been added.
This book provides a rigorous yet elementary introduction to the theory of analytic functions of a single complex variable. While presupposing in its readership a degree of mathematical maturity, it insists on no formal prerequisites beyond a sound knowledge of calculus. Starting from basic definitions, the text slowly and carefully develops the ideas of complex analysis to the point where such landmarks of the subject as Cauchy's theorem, the Riemann mapping theorem, and the theorem of Mittag-Leffler can be treated without sidestepping any issues of rigor. The emphasis throughout is a geometric one, most pronounced in the extensive chapter dealing with conformal mapping, which amounts essentially to a "short course" in that important area of complex function theory. Each chapter concludes with a wide selection of exercises, ranging from straightforward computations to problems of a more conceptual and thought-provoking nature.
Complex analysis is a cornerstone of mathematics, making it an essential element of any area of study in graduate mathematics. Schlag's treatment of the subject emphasizes the intuitive geometric underpinnings of elementary complex analysis that naturally lead to the theory of Riemann surfaces. The book begins with an exposition of the basic theory of holomorphic functions of one complex variable. The first two chapters constitute a fairly rapid, but comprehensive course in complex analysis. The third chapter is devoted to the study of harmonic functions on the disk and the half-plane, with an emphasis on the Dirichlet problem. Starting with the fourth chapter, the theory of Riemann surfaces is developed in some detail and with complete rigor. From the beginning, the geometric aspects are emphasized and classical topics such as elliptic functions and elliptic integrals are presented as illustrations of the abstract theory. The special role of compact Riemann surfaces is explained, and their connection with algebraic equations is established. The book concludes with three chapters devoted to three major results: the Hodge decomposition theorem, the Riemann-Roch theorem, and the uniformization theorem. These chapters present the core technical apparatus of Riemann surface theory at this level. This text is intended as a detailed, yet fast-paced intermediate introduction to those parts of the

theory of one complex variable that seem most useful in other areas of mathematics, including geometric group theory, dynamics, algebraic geometry, number theory, and functional analysis. More than seventy figures serve to illustrate concepts and ideas, and the many problems at the end of each chapter give the reader ample opportunity for practice and independent study.

Functions of a Complex Variable and Some of Their Applications, Volume 1, discusses the fundamental ideas of the theory of functions of a complex variable. The book is the result of a complete rewriting and revision of a translation of the second (1957) Russian edition. Numerous changes and additions have been made, both in the text and in the solutions of the Exercises. The book begins with a review of arithmetical operations with complex numbers. Separate chapters discuss the fundamentals of complex analysis; the concept of conformal transformations; the most important of the elementary functions; and the complex potential for a plane vector field and the application of the simplest methods of function theory to the analysis of such a field. Subsequent chapters cover the fundamental apparatus of the theory of regular functions, i.e. basic integral theorems and expansions in series; the general concept of an analytic function; applications of the theory of residues; and polygonal domain mapping. This book is intended for undergraduate and postgraduate students of higher technical institutes and for engineers wishing to increase their knowledge of theory.

This classic and long out of print text by the famous French mathematician Henri Cartan, has finally been retitled and reissued as an unabridged reprint of the Kershaw Publishing Company 1971 edition at remarkably low price for a new generation of university students and teachers. It provides a concise and beautifully written course on rigorous analysis. Unlike most similar texts, which usually develop the theory in either metric or Euclidean spaces, Cartan's text is set entirely in normed vector spaces, particularly Banach spaces. This not only allows the author to develop carefully the concepts of calculus in a setting of maximal generality, it allows him to unify both single and multivariable calculus over either the real or complex scalar fields by considering derivatives of nth orders as linear transformations. This prepares the student for the subsequent study of differentiable manifolds modeled on Banach spaces as well as graduate analysis courses, where normed spaces and their isomorphisms play a central role. More importantly, it's republication in an inexpensive edition finally makes available again the English translations of both long separated halves of Cartan's famous 1965-6 analysis course at the University of Paris: The second half has been in print for over a decade as Differential Forms , published by Dover Books. Without the first half, it has been very difficult for readers of that second half text to be prepared with the proper prerequisites as Cartan originally intended. With both texts now available at very affordable prices, the entire course can now be easily obtained and studied as it was originally intended. The book is divided into two chapters. The first develops the abstract differential calculus. After an introductory section providing the necessary background on the elements of Banach spaces, the Frechet derivative is defined, and proofs are given of the two basic theorems of differential calculus: The mean value theorem and the inverse function theorem. The chapter proceeds with the introduction and study of higher order derivatives and a proof of Taylor's formula. It closes with a study of local maxima and minima including both necessary and sufficient conditions for the existence of such minima. The second chapter is devoted to differential equations. Then the general existence and uniqueness theorems for ordinary differential equations on Banach spaces are proved. Applications of this material to linear equations and to obtaining various properties of solutions of differential equations are then given. Finally the relation between partial differential equations of the first order and ordinary differential equations is discussed. The prerequisites are rigorous first courses in calculus on the real line (elementary analysis), linear algebra on abstract vectors spaces with linear transformations and the basic definitions of topology (metric spaces, topology,etc.) A basic course in differential equations is advised as well. Together with its' sequel, Differential Calculus On Normed Spaces forms the basis for an outstanding advanced undergraduate/first year graduate analysis course in the Bourbakian French tradition of Jean Dieudonn's Foundations of Modern Analysis, but a more accessible level and much more affordable then that classic.

The subject of real analytic functions is one of the oldest in mathe matical analysis. Today it is encountered early in ones mathematical training: the first taste usually comes in calculus. While most work ing mathematicians use real analytic functions from time to time in their work, the vast lore of real analytic functions remains obscure and buried in the literature. It is remarkable that the most accessible treatment of Puiseux's theorem is in Lefschetz's quite old Algebraic Geometry, that the clearest discussion of resolution of singularities for real analytic manifolds is in a book review by Michael Atiyah, that there is no comprehensive discussion in print of the embedding prob lem for real analytic manifolds. We have had occasion in our collaborative research to become ac quainted with both the history and the scope of the theory of real analytic functions. It seems both appropriate and timely for us to gather together this information in a single volume. The material presented here is of three kinds. The elementary topics, covered in Chapter 1, are presented in great detail. Even results like a real ana lytic inverse function theorem are difficult to find in the literature, and we take pains here to present such topics carefully. Topics of middling difficulty, such as separate real analyticity, Puiseux series, the FBI transform, and related ideas (Chapters 2-4), are covered thoroughly but rather more briskly.