# Analysis And Algebra On Differentiable Manifolds A Workbook For Students And Teachers Problem Books In Mathematics

Pesticides continue to provide an important tool in integrated pest management (IPM) programmes. Hitherto IPM programmes have had a strong bias towards insect control, but farmers need to control weeds, plant pathogens and other pest problems.This book follows the author's successful “pesticide application methods” by relating the equipment needs to the overall pest control requirement of major crops. It outlines the pest problems against which farmers are using pesticides and focusses on the details of the application techniques they need to optimise pesticide use.Much attention is now being given to genetically modified crops, but these do not necessarily avoid the use of pesticides. Some are engineered to be resistant to certain herbicides, so the use of these herbicides will still require careful application in order to minimise environmental side effects. Similarly, crops engineered for resistance to certain insect pest species may remain susceptible to other pests, thus emphasising the need for crop monitoring and careful use of any chemicals to avoid disrupting biological control.

This book presents a systematic and comprehensive account of the theory of differentiable manifolds and provides the necessary background for the use of fundamental differential topology tools. The text includes, in particular, the earlier works of Stephen Smale, for which he was awarded the Fields Medal. Explicitly, the topics covered are Thom transversality, Morse theory, theory of handle presentation, h-cobordism theorem and the generalised Poincaré conjecture. The material is the outcome of lectures and seminars on various aspects of differentiable manifolds and differential topology given over the years at the Indian Statistical Institute in Calcutta, and at other universities throughout India. The book will appeal to graduate students and researchers interested in these topics. An elementary knowledge of linear algebra, general topology, multivariate calculus, analysis and algebraic topology is recommended.

A famous Swiss professor gave a student’s course in Basel on Riemann surfaces. After a couple of lectures, a student asked him, “Professor, you have as yet not given an exact de nition of a Riemann surface.” The professor answered, “With Riemann surfaces, the main thing is to UNDERSTAND them, not to de ne them.” The student’s objection was reasonable. From a formal viewpoint, it is of course necessary to start as soon as possible with strict de nitions, but the professor’s - swer also has a substantial background. The pure de nition of a Riemann surface— as a complex 1-dimensional complex analytic manifold—contributes little to a true understanding. It takes a long time to really be familiar with what a Riemann s- face is. This example is typical for the objects of global analysis—manifolds with str- tures. There are complex concrete de nitions but these do not automatically explain what they really are, what we can do with them, which operations they really admit, how rigid they are. Hence, there arises the natural question—how to attain a deeper understanding? One well-known way to gain an understanding is through underpinning the d- nitions, theorems and constructions with hierarchies of examples, counterexamples and exercises. Their choice, construction and logical order is for any teacher in global analysis an interesting, important and fun creating task.

This book is a collection of 375 completely solved exercises on differentiable manifolds, Lie groups, fibre bundles, and Riemannian manifolds. The exercises go from elementary computations to rather sophisticated tools. It is the first book consisting of completely solved problems on differentiable manifolds, and therefore will be a complement to the books on theory. A 42-page formulary is included which will be useful as an aide-mémoire, especially for teachers and researchers on these topics. The book includes 50 figures. Audience: The book will be useful to advanced undergraduate and graduate students of mathematics, theoretical physics, and some branches of engineering.

A. Audience. This treatise (consisting of the present VoU and of VoUI, to be published) is primarily intended to be a textbook for a core course in mathematics at the advanced undergraduate or the beginning graduate level. The treatise should also be useful as a textbook for selected stu dents in honors programs at the sophomore and junior level. Finally, it should be of use to theoretically inclined scientists and engineers who wish to gain a better understanding of those parts of mathemat ics that are most likely to help them gain insight into the conceptual foundations of the scientific discipline of their interest. B. Prerequisites. Before studying this treatise, a student should be familiar with the material summarized in Chapters 0 and 1 of Vol.1. Three one-semester courses in serious mathematics should be sufficient to gain such fa miliarity. The first should be an introduction to contemporary math ematics and should cover sets, families, mappings, relations, number systems, and basic algebraic structures. The second should be an in troduction to rigorous real analysis, dealing with real numbers and real sequences, and with limits, continuity, differentiation, and integration of real functions of one real variable. The third should be an intro duction to linear algebra, with emphasis on concepts rather than on computational procedures. C. Organization.

In developing the tools necessary for the study of complex manifolds, this comprehensive, well-organized treatment presents in its opening chapters a detailed survey of recent progress in four areas: geometry (manifolds with vector bundles), algebraic topology, differential geometry, and partial differential equations. Subsequent chapters then develop such topics as Hermitian exterior algebra and the Hodge *-operator, harmonic theory on compact manifolds, differential operators on a Kahler manifold, the Hodge decomposition theorem on compact Kahler manifolds, the Hodge-Riemann bilinear relations on Kahler manifolds, Griffiths's period mapping, quadratic transformations, and Kodaira's vanishing and embedding theorems. The third edition of this standard reference contains a new appendix by Oscar Garcia-Prada which gives an overview of certain developments in the field during the decades since the book first appeared. From reviews of the 2nd Edition: "..the new edition of Professor Wells' book is timely and welcome...an excellent introduction for any mathematician who suspects that complex manifold techniques may be relevant to his work." - Nigel Hitchin, Bulletin of the London Mathematical Society "Its purpose is to present the basics of analysis and geometry on compact complex manifolds, and is already one of the standard sources for this material." - Daniel M. Burns, Jr., Mathematical Reviews This book focuses on Hamilton's Ricci flow, beginning with a detailed discussion of the required aspects of differential geometry, progressing through existence and regularity theory, compactness theorems for Riemannian manifolds, and Perelman's noncollapsing results, and culminating in a detailed analysis of the evolution of curvature, where recent breakthroughs of Böhm and Wilking and Brendle and Schoen have led to a proof of the differentiable 1/4-pinching sphere theorem.

Critical Point Theory in Global Analysis and Differential Topology

The book begins at the level of an undergraduate student assuming only basic knowledge of calculus in one variable. It rigorously treats topics such as multivariable differential calculus, Lebesgue integral, vector calculus and differential equations. After having built on a solid foundation of topology and linear algebra, the text later expands into more advanced topics such as complex analysis, differential forms, calculus of variations, differential geometry and even functional analysis. Overall, this text provides a unique and well-rounded introduction to the highly developed and multi-faceted subject of mathematical analysis, as understood by a mathematician today.?

The book comprises a rigorous and self-contained treatment of initial-value problems for ordinary differential equations. It additionally develops the basics of control theory, which is a unique feature in current textbook literature. The following topics are particularly emphasised: • existence, uniqueness and continuation of solutions, • continuous dependence on initial data, • flows, • qualitative behaviour of solutions, • limit sets, • stability theory, • invariance principles, • introductory control theory, • feedback and stabilization. The last two items cover classical control theoretic material such as linear control theory and absolute stability of nonlinear feedback systems. It also includes an introduction to the more recent concept of input-to-state stability. Only a basic grounding in linear algebra and analysis is assumed. Ordinary Differential Equations will be suitable for final year undergraduate students of mathematics and appropriate for beginning postgraduates in mathematics and in mathematically oriented engineering and science.

Introduction to Analysis is an ideal text for a one semester course on analysis. The book covers standard material on the real numbers, sequences, continuity, differentiation, and series, and includes an introduction to proof. The author has endeavored to write this book entirely from the student's perspective: there is enough rigor to challenge even the best students in the class, but also enough explanation and detail to meet the needs of a struggling student. From the Author to the student: "I vividly recall sitting in an Analysis class and asking myself, 'What is all of this for?' or 'I don't have any idea what's going on.' This book is designed to help the student who finds themselves asking the same sorts of questions, but will also challenge the brightest students." Chapter 1 is a basic introduction to logic and proofs. Informal summaries of the idea of proof provided before each result, and before a solution to a practice problem. Every chapter begins with a short summary, followed by a brief abstract of each section. Each section ends with a concise and referenced summary of the material which is designed to give the student a "big picture" idea of each section. There is a brief and non-technical summary of the goals of a proof or solution for each of the results and practice problems in this book, which are clearly marked as "Idea of proof," or as "Methodology", followed by a clearly marked formal proof or solution. Many references to previous definitions and results. A "Troubleshooting Guide" appears at the end of each chapter that answers common questions.

This book is based on the full year Ph.D. qualifying course on differentiable manifolds, global calculus, differential geometry, and related topics, given by the author at Washington University several times over a twenty year period. It is addressed primarily to second year graduate students and well prepared first year students. Presupposed is a good grounding in general topology and modern algebra, especially linear algebra and the analogous theory of modules over a commutative, unitary ring. Although billed as a "first course" , the book is not intended to be an overly sketchy introduction. Mastery of this material should prepare the student for advanced topics courses and seminars in differen tial topology and geometry. There are certain basic themes of which the reader should be aware. The first concerns the role of differentiation as a process of linear approximation of non linear problems. The well understood methods of linear algebra are then applied to the resulting linear problem and, where possible, the results are reinterpreted in terms of the original nonlinear problem. The process of solving differential equations (i. e., integration) is the reverse of differentiation. It reassembles an infinite array of linear approximations, result ing from differentiation, into the original nonlinear data. This is the principal tool for the reinterpretation of the linear algebra results referred to above.

The study of the basic elements of smooth manifolds is one of the most important courses for mathematics and physics graduate students. Inexpensively priced and quality textbooks on the subject are currently particularly scarce. Matshushima's book is a welcome addition to the literature in a very low priced edition. The prerequisites for the course are solid undergraduate courses in real analysis of several variables, linear and abstract algebra and point-set topology. A previous classical differential geometry course on curve and surface theory isn't really necessary, but will greatly enhance a first course in manifolds by supplying many low-dimensional examples in ?n . The standard topics for such a course are all covered masterfully and concisely: Differentiable manifolds and their atlases, smooth mappings, immersions and embeddings, submanifolds, multilinear algebra, Lie groups and algebras, integration of differential forms and much more. This book is remarkable in it's clarity and range, more so then most other introductions of the subject. Not only does it cover more material then most introductions to manifolds in a concise but readable manner, but it covers in detail several topics most introductions do not, such as homogeneous spaces and Lie subgroups. Most significantly, it covers a major topic that most books at this level avoid: complex and almost complex manifolds. Despite the fact complex and almost complex manifolds are incredibly important in both pure mathematics and mathematical physics-they play important roles in both differential and algebraic geometry, as well as in the modern formulation of geometry in general relativity, particularly in modeling spacetime curvature near conditions of extreme gravitational force such as neutron stars and black holes -almost all introductory textbooks on differentiable manifolds vehemently avoid both. Part of the reason is the subject's difficulty once one gets past the most basic elements, which is considerable and requires sophisticated machinery from algebra and topology such as sheaves and cohomology. Another reason is that complex manifolds are important in both differential geometry and its' sister subject, algebraic geometry-and it's difficult sometimes to separate these aspects. By discussing only the barest essentials of complex manifolds, Mashushima avoids both these problems. This unique content usually absent in introductory texts and presented by a master makes the book far more valuable as a supplementary and reference text. Blue Collar Scholar is now proud to republish this lost classic in an inexpensive new edition for strong undergraduates and first year graduate students of both mathematics and the physical sciences.BCS founder Karo Maestro has added his usual personal touch with a preface introducing the student to smooth manifolds and a recommended reading list for further study. Matsushima's book is a wonderful, self contained and inexpensive basis for a first course on the subject that will provide a strong foundation for either subsequent courses in differential geometry or advanced courses on smooth manifold theor

Manifolds, the higher-dimensional analogs of smooth curves and surfaces, are fundamental objects in modern mathematics. Combining aspects of algebra, topology, and analysis, manifolds have also been applied to classical mechanics, general relativity, and quantum field theory. In this streamlined introduction to the subject, the theory of manifolds is presented with the aim of helping the reader achieve a rapid mastery of the essential topics. By the end of the book the reader should be able to compute, at least for simple spaces, one of the most basic topological invariants of a manifold, its de Rham cohomology. Along the way, the reader acquires the knowledge and skills necessary for further study of geometry and topology. The requisite point-set topology is included in an appendix of twenty pages; other appendices review facts from real analysis and linear algebra. Hints and solutions are provided to many of the exercises and problems. This work may be used as the text for a one-semester graduate or advanced undergraduate course, as well as by students engaged in self-study. Requiring only minimal undergraduate prerequisites, 'Introduction to Manifolds' is also an excellent foundation for Springer's GTM 82, 'Differential Forms in Algebraic Topology'.

This is a comprehensive review of commutative algebra, from localization and primary decomposition through dimension theory, homological methods, free resolutions and duality, emphasizing the origins of the ideas and their connections with other parts of mathematics. The book gives a concise treatment of Grobner basis theory and the constructive methods in commutative algebra and algebraic geometry that flow from it. Many exercises included.

Spaces is a modern introduction to real analysis at the advanced undergraduate level. It is forward-looking in the sense that it first and foremost aims to provide students with the concepts and techniques they need in order to follow more advanced courses in mathematical analysis and neighboring fields. The only prerequisites are a solid understanding of calculus and linear algebra. Two introductory chapters will help students with the transition from computation-based calculus to theory-based analysis. The main topics covered are metric spaces, spaces of continuous functions, normed spaces, differentiation in normed spaces, measure and integration theory, and Fourier series. Although some of the topics are more advanced than what is usually found in books of this level, care is taken to present the material in a way that is suitable for the intended audience: concepts are carefully introduced and motivated, and proofs are presented in full detail. Applications to differential equations and Fourier analysis are used to illustrate the power of the theory, and exercises of all levels from routine to real challenges help students develop their skills and understanding. The text has been tested in classes at the University of Oslo over a number of years.

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.

Exterior analysis uses differential forms (a mathematical technique) to analyze curves, surfaces, and structures. Exterior Analysis is a first-of-its-kind resource that uses applications of differential forms, offering a mathematical approach to solve problems in defining a precise measurement to ensure structural integrity. The book provides methods to study different types of equations and offers detailed explanations of fundamental theories and techniques to obtain concrete solutions to determine symmetry. It is a useful tool for structural, mechanical and electrical engineers, as well as physicists and mathematicians. Provides a thorough explanation of how to apply differential equations to solve real-world engineering problems Helps researchers in mathematics, science, and engineering develop skills needed to implement mathematical techniques in their research Includes physical applications and methods used to solve practical problems to determine symmetry

This is the second edition of this best selling problem book for students, now containing over 400 completely solved exercises on differentiable manifolds, Lie theory, fibre bundles and Riemannian manifolds. The exercises go from elementary computations to rather sophisticated tools. Many of the definitions and theorems used throughout are explained in the first section of each chapter where they appear. A 56-page collection of formulae is included which can be useful as an aide-mémoire, even for teachers and researchers on those topics. In this 2nd edition: • 76 new problems • a section devoted to a generalization of Gauss' Lemma • a short novel section dealing with some properties of the energy of Hopf vector fields • an expanded collection of formulae and tables • an extended bibliography Audience This book will be useful to advanced undergraduate and graduate students of mathematics, theoretical physics and some branches of engineering with a rudimentary knowledge of linear and multilinear algebra.

A brand new appendix by Oscar Garcia-Prada graces this third edition of a classic work. In developing the tools necessary for the study of complex manifolds, this comprehensive, well-organized treatment presents in its opening chapters a detailed survey of recent progress in four areas: geometry (manifolds with vector bundles), algebraic topology, differential geometry, and partial differential equations. Wells's superb analysis also gives details of the Hodge-Riemann bilinear relations on Kahler manifolds, Griffiths's period mapping, quadratic transformations, and Kodaira's vanishing and embedding theorems. Oscar Garcia-Prada's appendix gives an overview of the developments in the field during the decades since the book appeared.

General Topology and Its Relations to Modern Analysis and Algebra II is comprised of papers presented at the Second Symposium on General Topology and its Relations to Modern Analysis and Algebra, held in Prague in September 1966. The book contains expositions and lectures that discuss various subject matters in the field of General Topology. The topics considered include the algebraic structure for a topology; the projection spectrum and its limit space; some special methods of homeomorphism theory in infinite-dimensional topology; types of ultrafilters on countable sets; the compactness operator in general topology; and the algebraic generalization of the topological theorems of Bolzano and Weierstrass. This publication will be found useful by all specialists in the field of Topology and mathematicians interested in General Topology.

Geometrical concepts play a significant role in the analysis of physical systems. Apart from the intrinsic interest, the knowledge of differentiable manifolds has become useful — even mandatory — in an ever-increasing number of areas of mathematics and its applications. Many results/concepts in analysis find their most natural (generalized) setting in manifold theory. An interrelation of geometry and analysis can be found in this volume. The book presents original research, besides a few survey articles by eminent experts from all over the world on current trends of research in differential and algebraic geometry, classical and modern analysis including the theory of distributions (linear and nonlinear), partial differential equations and wavelets.

Degree students of mathematics are often daunted by the mass of definitions and theorems with which they must familiarize themselves. In the fields algebra and analysis this burden will now be reduced because in A Handbook of Terms they will find sufficient explanations of the terms and the symbolism that they are likely to come across in their university courses. Rather than being like an alphabetical dictionary, the order and division of the sections correspond to the way in which mathematics can be developed. This arrangement, together with the numerous notes and examples that are interspersed with the text, will give students some feeling for the underlying mathematics. Many of the terms are explained in several sections of the book, and alternative definitions are given. Theorems, too, are frequently stated at alternative levels of generality. Where possible, attention is drawn to those occasions where various authors ascribe different meanings to the same term. The handbook will be extremely useful to students for revision purposes. It is also an excellent source of reference for professional mathematicians, lecturers and teachers.

A great book ... a necessary item in any mathematical library. --S. S. Chern, University of California A brilliant book: rigorous, tightly organized, and covering a vast amount of good mathematics. --Barrett O'Neill, University of California This is obviously a very valuable and well thought-out book on an important subject. --Andre Weil, Institute for Advanced Study The study of homogeneous spaces provides excellent insights into both differential geometry and Lie groups. In geometry, for instance, general theorems and properties will also hold for homogeneous spaces, and will usually be easier to understand and to prove in this setting. For Lie groups, a significant amount of analysis either begins with or reduces to analysis on homogeneous spaces, frequently on symmetric spaces. For many years and for many mathematicians, Sigurdur Helgason's classic Differential Geometry, Lie Groups, and Symmetric Spaces has been--and continues to be--the standard source for this material. Helgason begins with a concise, self-contained introduction to differential geometry. Next is a careful treatment of the foundations of the theory of Lie groups, presented in a manner that since 1962 has served as a model to a number of subsequent authors. This sets the stage for the introduction and study of symmetric spaces, which form the central part of the book. The text concludes with the classification of symmetric spaces by means of the Killing-Cartan classification of simple Lie algebras over $\mathbb{C}$ and Cartan's classification of simple Lie algebras over $\mathbb{R}$, following a method of Victor Kac. The excellent exposition is supplemented by extensive collections of useful exercises at the end of each chapter. All of the problems have either solutions or substantial hints, found at the back of the book. For this edition, the author has made corrections and added helpful notes and useful references. Sigurdur Helgason was awarded the Steele Prize for Differential Geometry, Lie Groups, and Symmetric Spaces and Groups and Geometric Analysis.

Real Analysis: Measures, Integrals and Applications is devoted to the basics of integration theory and its related topics. The main emphasis is made on the properties of the Lebesgue integral and various applications both classical and those rarely covered in literature. This book provides a detailed introduction to Lebesgue measure and integration as well as the classical results concerning integrals of multivariable functions. It examines the concept of the Hausdorff measure, the properties of the area on smooth and Lipschitz surfaces, the divergence formula, and Laplace's method for finding the asymptotic behavior of integrals. The general theory is then applied to harmonic analysis, geometry, and topology. Preliminaries are provided on probability theory, including the study of the Rademacher functions as a sequence of independent random variables. The book contains more than 600 examples and exercises. The reader who has mastered the first third of the book will be able to study other areas of mathematics that use integration, such as probability theory, statistics, functional analysis, partial probability theory, statistics, functional analysis, partial differential equations and others. Real Analysis: Measures, Integrals and Applications is intended for advanced undergraduate and graduate students in mathematics and physics. It assumes that the reader is familiar with basic linear algebra and differential calculus of functions of several variables.

The text is designed for use in a forty-lecture introductory course covering linear algebra, multivariable differential calculus, and an introduction to real analysis. The core material of the book is arranged to allow for the main introductory material on linear algebra, including basic vector space theory in Euclidean space and the initial theory of matrices and linear systems, to be covered in the first ten or eleven lectures, followed by a similar number of lectures on basic multivariable analysis, including first theorems on differentiable functions on domains in Euclidean space and a brief introduction to submanifolds. The book then concludes with further essential linear algebra, including the theory of determinants, eigenvalues, and the spectral theorem for real symmetric matrices, and further multivariable analysis, including the contraction mapping principle and the inverse and implicit function theorems. There is also an appendix which provides a nine-lecture introduction to real analysis. There are various ways in which the additional material in the appendix could be integrated into a course--for example in the Stanford Mathematics honors program, run as a four-lecture per week program in the Autumn Quarter each year, the first six lectures of the nine-lecture appendix are presented at the rate of one lecture per week in weeks two through seven of the quarter, with the remaining three lectures per week during those weeks being devoted to the main chapters of the text. It is hoped that the text would be suitable for a quarter or semester course for students who have scored well in the BC Calculus advanced placement examination (or equivalent), particularly those who are considering a possible major in mathematics. The author has attempted to make the presentation rigorous and complete, with the clarity and simplicity needed to make it accessible to an appropriately large group of students. Table of Contents: Linear Algebra / Analysis in R / More Linear Algebra / More Analysis in R / Appendix: Introductory Lectures on Real Analysis

Systematically develop the concepts and tools that are vital to every mathematician, whether pure or applied, aspiring or established A comprehensive treatment with a global view of the subject, emphasizing the connections between real analysis and other branches of mathematics Included throughout are many examples and hundreds of problems, and a separate 55-page section gives hints or complete solutions for most.

Analysis and Algebra on Differentiable ManifoldsA Workbook for Students and TeachersSpringer Science & Business Media

This Proceedings Volume contains 32 articles on various interesting areas of present-day functional analysis and its applications: Banach spaces and their geometry, operator ideals, Banach and operator algebras, operator and spectral theory, Frechet spaces and algebras, function and sequence spaces. The authors have taken much care with their articles and many papers present important results and methods in active fields of research. Several survey type articles (at the beginning and the end of the book) will be very useful for mathematicians who want to learn "what is going on" in some particular field of research.

This is part one of a two-volume book on real analysis and is intended for senior undergraduate students of mathematics who have already been exposed to calculus. The emphasis is on rigour and foundations of analysis. Beginning with the construction of the number systems and set theory, the book discusses the basics of analysis (limits, series, continuity, differentiation, Riemann integration), through to power series, several variable calculus and Fourier analysis, and then finally the Lebesgue integral. These are almost entirely set in the concrete setting of the real line and Euclidean spaces, although there is some material on abstract metric and topological spaces. The book also has appendices on mathematical logic and the decimal system. The entire text (omitting some less central topics) can be taught in two quarters of 25–30 lectures each. The course material is deeply intertwined with the exercises, as it is intended that the student actively learn the material (and practice thinking and writing rigorously) by proving several of the key results in the theory.

This unique book provides a new and well-motivated introduction to calculus and analysis, historically significant fundamental areas of mathematics that are widely used in many disciplines. It begins with familiar elementary high school geometry and algebra, and develops important concepts such as tangents and derivatives without using any advanced tools based on limits and infinite processes that dominate the traditional introductions to the subject. This simple algebraic method is a modern version of an idea that goes back to René Descartes and that has been largely forgotten. Moving beyond algebra, the need for new analytic concepts based on completeness, continuity, and limits becomes clearly visible to the reader while investigating exponential functions. The author carefully develops the necessary foundations while minimizing the use of technical language. He expertly guides the reader to deep fundamental analysis results, including completeness, key differential equations, definite integrals, Taylor series for standard functions, and the Euler identity. This pioneering book takes the sophisticated reader from simple familiar algebra to the heart of analysis. Furthermore, it should be of interest as a source of new ideas and as supplementary reading for high school teachers, and for students and instructors of calculus and analysis.

The second volume expounds classical analysis as it is today, as a part of unified mathematics, and its interactions with modern mathematical courses such as algebra, differential geometry, differential equations, complex and functional analysis. The book provides a firm foundation for advanced work in any of these directions.

The second edition of An Introduction to Differentiable Manifolds and Riemannian Geometry, Revised has sold over 6,000 copies since publication in 1986 and this revision will make it even more useful. This is the only book available that is approachable by "beginners" in this subject. It has become an essential introduction to the subject for mathematics students, engineers, physicists, and economists who need to learn how to apply these vital methods. It is also the only book that thoroughly reviews certain areas of advanced calculus that are necessary to understand the subject. Line and surface integrals Divergence and curl of vector fields