

Elements Of Differential Topology By Anant R Shastri

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Journal of the Indian Institute of Science - Indian Institute of Science, Bangalore 1991

Kazhdan's Property (T) - Bekka M Bachir La Harpe Pierre de Valette Alain 2014-05-14

A comprehensive introduction to the role of Property (T), with applications to an amazing number of fields within mathematics.

Notices of the American Mathematical Society - American Mathematical Society 1991

Differential Geometry and Topology - Keith Burns 2005-05-27

Accessible, concise, and self-contained, this book offers an outstanding introduction to three related subjects: differential geometry, differential topology, and dynamical systems. Topics of special interest addressed in the book include Brouwer's fixed point theorem, Morse Theory, and the geodesic flow. Smooth manifolds, Riemannian metrics, affine connections, the curvature tensor, differential forms, and integration on manifolds provide the foundation for many applications in dynamical systems and mechanics. The authors also discuss the Gauss-Bonnet theorem and its implications in non-Euclidean geometry models. The differential topology aspect of the book centers on classical, transversality theory, Sard's theorem, intersection theory, and fixed-point theorems. The construction of the de Rham cohomology builds further arguments for the strong connection between the differential structure and the topological structure. It also furnishes some of the tools necessary for a complete understanding of the Morse theory. These discussions are followed by an introduction to the theory of hyperbolic systems, with emphasis on the quintessential role of the geodesic flow. The integration of geometric theory, topological theory, and concrete applications to dynamical systems set this book apart. With clean, clear prose and effective examples, the authors' intuitive approach creates a treatment that is comprehensible to relative beginners, yet rigorous enough for those with more background and experience in the field.

The Cumulative Book Index - 1974

The Power of Human Imagination - Jerome L. Singer 2012-12-06

For at least half of the twentieth century, psychology and the other mental health professions all but ignored the significant adaptive possibilities of the human gift of imagery. Our capacity seemingly to duplicate sights, sounds, and other sensory experiences through some form of central brain process continues to remain a mysterious, almost miraculous skill. Because imagery is so much a private

experience, experimental psychologists found it hard to measure and turned their attention to observable behaviors that could easily be studied in animals as well as in humans. Psychoanalysts and others working with the emotionally disturbed continued to take imagery information seriously in the form of dream reports, transference fantasies, and as indications of hallucinations or delusions. On the whole, however, they emphasized the maladaptive aspects of the phenomena, the distortions and defensiveness or the "regressive" qualities of daydreams and sequences of images. The present volume grows out of a long series of investigations by the senior author that have suggested that daydreaming and the stream of consciousness are not simply manifestations in adult life of persisting phenomena of childhood. Rather, the data suggest that imagery sequences represent a major system of encoding and transforming information, a basic human capacity that is inevitably part of the brain's storage process and one that has enormous potential for adaptive utility. A companion volume, *The Stream of Consciousness*, edited by Kenneth S. Pope and Jerome L.

The ASEAN Way - Ms. Ana Corbacho 2018-10-02

The first part of the book examines the evolution of monetary policy and prudential frameworks of the ASEAN5, with particular focus on changes since the Asian financial crisis and the more recent period of unconventional monetary policy in advanced economies. The second part of the book looks at policy responses to global financial spillovers. The third and last part of the book elaborates on the challenges ahead for monetary policy, financial stability frameworks, and the deepening of financial markets.

Super Bus 2 Tb Basque - Anant R Shastri 2000-05-01

This thorough, yet simple book is an ideal text and reference for postgraduate students of mathematics. Although it covers a large number of topics, from basic theory of complex numbers to Cauchy's theorem, the informal, interactive style makes the book extremely digestible.

Renewing U.S. Mathematics - National Research Council 1990-02-01

As requested by the National Science Foundation (NSF) and the Interagency Committee for Extramural Mathematics Programs (ICEMAP), this report updates the 1984 Report known as the "David Report." Specifically, the charge directed the committee to (1) update that report, describing the infrastructure and support for U.S. mathematical sciences research; (2) assess trends and progress over the intervening five years against the recommendations of the 1984 Report; (3) briefly assess the field scientifically and identify significant opportunities for research, including cross-disciplinary collaboration; and (4) make appropriate recommendations designed to ensure that U.S. mathematical sciences research will

meet national needs in coming years. Of the several components of the mathematical sciences community requiring action, its wellspring--university research departments--is the primary focus of this report. The progress and promise of research--described in the 1984 Report relative to theoretical development, new applications, and the refining and deepening of old applications--have if anything increased since 1984, making mathematics research ever more valuable to other sciences and technology. Although some progress has been made since 1984 in the support for mathematical sciences research, the goals set in the 1984 Report have not been achieved. Practically all of the increase in funding has gone into building the infrastructure, which had deteriorated badly by 1984. While graduate and postdoctoral research, computer facilities, and new institutes have benefited from increased resources, some of these areas are still undersupported by the standards of other sciences. And in the area of research support for individual investigators, almost no progress has been made. A critical shortage of qualified mathematical sciences researchers still looms, held at bay for the moment by a large influx of foreign researchers, an uncertain solution in the longer term. While government has responded substantially to the 1984 Report's recommendations, particularly in the support of infrastructure, the universities generally have not, so that the academic foundations of the mathematical sciences research enterprise are as shaky now as in 1984. The greatest progress has been made in the mathematics sciences community, whose members have shown a growing awareness of the problems confronting their discipline and increased interest in dealing with the problems, particularly in regard to communication with the public and government agencies and involvement in education. (AA)

Parallel Computer Architecture - David Culler 1999

This book outlines a set of issues that are critical to all of parallel architecture--communication latency, communication bandwidth, and coordination of cooperative work (across modern designs). It describes the set of techniques available in hardware and in software to address each issue and explore how the various techniques interact.

Knowledge Graphs - Aidan Hogan 2021-11-08

This book provides a comprehensive and accessible introduction to knowledge graphs, which have recently garnered notable attention from both industry and academia. Knowledge graphs are founded on the principle of applying a graph-based abstraction to data, and are now broadly deployed in scenarios that require integrating and extracting value from multiple, diverse sources of data at large scale. The book defines knowledge graphs and provides a high-level overview of how they are used. It presents and contrasts popular graph models that are commonly used to represent data as graphs, and the languages by which they can be queried before describing how the resulting data graph can be enhanced with notions of schema, identity, and context. The book discusses how ontologies and rules can be used to encode knowledge as well as how inductive techniques--based on statistics, graph analytics, machine learning, etc.--can be used to encode and extract knowledge. It covers techniques for the creation, enrichment, assessment, and refinement of knowledge graphs and surveys recent open and enterprise knowledge graphs and the industries or applications within which they have been most widely adopted. The book closes by discussing the current limitations and future directions along which knowledge graphs are likely to evolve. This book is aimed at students, researchers, and practitioners who wish to learn more about knowledge graphs and how they facilitate extracting value from diverse data at large scale. To make the book accessible for newcomers, running examples and graphical notation

are used throughout. Formal definitions and extensive references are also provided for those who opt to delve more deeply into specific topics.

Dirichlet's Problem - George Emil Raynor 1923

Molecular Biology and Biotechnology of Plant Organelles - Henry Daniell, Ph.D. 2007-11-04

We have taught plant molecular biology and biotechnology at the undergraduate and graduate level for over 20 years. In the past few decades, the field of plant organelle molecular biology and biotechnology has made immense strides. From the green revolution to golden rice, plant organelles have revolutionized agriculture. Given the exponential growth in research, the problem of finding appropriate textbooks for courses in plant biotechnology and molecular biology has become a major challenge. After years of handing out photocopies of various journal articles and reviews scattered through out the print and electronic media, a serendipitous meeting occurred at the 2002 IATPC World Congress held in Orlando, Florida. After my talk and evaluating several posters presented by investigators from my laboratory, Dr. Jacco Flipsen, Publishing Manager of Kluwer Publishers asked me whether I would consider editing a book on Plant Organelles. I accepted this challenge, after months of deliberations, primarily because I was unsuccessful in finding a text book in this area for many years. I signed the contract with Kluwer in March 2003 with a promise to deliver a camera-ready textbook on July 1, 2004. Given the short deadline and the complexity of the task, I quickly realized this task would need a co-editor. Dr. Christine Chase was the first scientist who came to my mind because of her expertise in plant mitochondria, and she readily agreed to work with me on this book.

Simplicial Objects in Algebraic Topology - J. P. May 1992

Simplicial sets are discrete analogs of topological spaces. They have played a central role in algebraic topology ever since their introduction in the late 1940s, and they also play an important role in other areas such as geometric topology and algebraic geometry. On a formal level, the homotopy theory of simplicial sets is equivalent to the homotopy theory of topological spaces. In view of this equivalence, one can apply discrete, algebraic techniques to perform basic topological constructions. These techniques are particularly appropriate in the theory of localization and completion of topological spaces, which was developed in the early 1970s. Since it was first published in 1967, *Simplicial Objects in Algebraic Topology* has been the standard reference for the theory of simplicial sets and their relationship to the homotopy theory of topological spaces. J. Peter May gives a lucid account of the basic homotopy theory of simplicial sets, together with the equivalence of homotopy theories alluded to above. The central theme is the simplicial approach to the theory of fibrations and bundles, and especially the algebraization of fibration and bundle theory in terms of "twisted Cartesian products." The Serre spectral sequence is described in terms of this algebraization. Other topics treated in detail include Eilenberg-MacLane complexes, Postnikov systems, simplicial groups, classifying complexes, simplicial Abelian groups, and acyclic models. "*Simplicial Objects in Algebraic Topology* presents much of the elementary material of algebraic topology from the semi-simplicial viewpoint. It should prove very valuable to anyone wishing to learn semi-simplicial topology. [May] has included detailed proofs, and he has succeeded very well in the task of organizing a large body of previously scattered material."--*Mathematical Review*

Alzheimer's Disease - Inga Zerr 2015-07-01

There is a wide scope of clinical phenomenology in Alzheimers disease, regarding the age of onset, presenting features, rate of progression and appearance of other clinical manifestation. Although clinical appearance and neuropathological hallmarks have been defining AD since its first description, major factors which trigger pathology are still unknown. The role of comorbidity is discussed controversially. Important environmental risk factors in AD development are continuous stress, low education and cardiovascular risk factors such as alcohol intake, smoking, hypertension. The role of lipids and cholesterol has been recognized, but the relevant pathogenetic steps are still to be identified. There is an urgent need to understand molecular disease pathogenesis in order to develop early therapeutic targets for the disease.

Books in Print Supplement - 1982

Includes authors, titles, subjects.

Elements of Differential Topology - Anant R. Shastri 2011-03-04

Derived from the author's course on the subject, Elements of Differential Topology explores the vast and elegant theories in topology developed by Morse, Thom, Smale, Whitney, Milnor, and others. It begins with differential and integral calculus, leads you through the intricacies of manifold theory, and concludes with discussions on algebraic topol

Introduction to Topology and Modern Analysis - George Finlay Simmons 1963

This material is intended to contribute to a wider appreciation of the mathematical words "continuity and linearity". The book's purpose is to illuminate the meanings of these words and their relation to each other --- Product Description.

Is Parallel Programming Hard - Paul E. McKenney 2015-06-13

Books in Series - 1979

Introduction to General Topology - K. D. Joshi 1983

Geometric Topology in Dimensions 2 and 3 - E.E. Moise 2013-06-29

Geometric topology may roughly be described as the branch of the topology of manifolds which deals with questions of the existence of homeomorphisms. Only in fairly recent years has this sort of topology achieved a sufficiently high development to be given a name, but its beginnings are easy to identify. The first classic result was the Schonflies theorem (1910), which asserts that every 1-sphere in the plane is the boundary of a 2-cell. In the next few decades, the most notable affirmative results were the "Schonflies theorem" for polyhedral 2-spheres in space, proved by J. W. Alexander [Ad], and the triangulation theorem for 2-manifolds, proved by T. Rad6 [Rd]. But the most striking results of the 1920s were negative. In 1921 Louis Antoine [A] published an extraordinary paper in which he showed that a variety of plausible conjectures in the topology of 3-space were false. Thus, a (topological) Cantor set in 3-space need not have a simply connected complement; therefore a Cantor set can be imbedded in 3-space in at least two essentially different ways; a topological 2-sphere in 3-space need not be the boundary of a 3-cell; given two disjoint 2-spheres in 3-space, there is not necessarily any third 2-sphere which separates them from one another in 3-space; and so on and on. The well-known "horned sphere" of Alexander [A] appeared soon thereafter.

Foundations of Analog and Digital Electronic Circuits - Anant Agarwal 2005-07-01

Unlike books currently on the market, this book attempts to satisfy two goals:

combine circuits and electronics into a single, unified treatment, and establish a strong connection with the contemporary world of digital systems. It will introduce a new way of looking not only at the treatment of circuits, but also at the treatment of introductory coursework in engineering in general. Using the concept of "abstraction," the book attempts to form a bridge between the world of physics and the world of large computer systems. In particular, it attempts to unify electrical engineering and computer science as the art of creating and exploiting successive abstractions to manage the complexity of building useful electrical systems. Computer systems are simply one type of electrical systems. +Balances circuits theory with practical digital electronics applications. +Illustrates concepts with real devices. +Supports the popular circuits and electronics course on the MIT OpenCourse Ware from which professionals worldwide study this new approach. +Written by two educators well known for their innovative teaching and research and their collaboration with industry. +Focuses on contemporary MOS technology.

Abstracts of Papers Presented to the American Mathematical Society - American Mathematical Society 1999

Complex Analysis in one Variable - NARASIMHAN 2012-12-06

This book is based on a first-year graduate course I gave three times at the University of Chicago. As it was addressed to graduate students who intended to specialize in mathematics, I tried to put the classical theory of functions of a complex variable in context, presenting proofs and points of view which relate the subject to other branches of mathematics. Complex analysis in one variable is ideally suited to this attempt. Of course, the branches of mathematics one chooses, and the connections one makes, must depend on personal taste and knowledge. My own leaning towards several complex variables will be apparent, especially in the notes at the end of the different chapters. The first three chapters deal largely with classical material which is available in the many books on the subject. I have tried to present this material as efficiently as I could, and, even here, to show the relationship with other branches of mathematics. Chapter 4 contains a proof of Picard's theorem; the method of proof I have chosen has far-reaching generalizations in several complex variables and in differential geometry. The next two chapters deal with the Runge approximation theorem and its many applications. The presentation here has been strongly influenced by work on several complex variables.

Data Science - Ivo D. Dinov 2021-12-06

The amount of new information is constantly increasing, faster than our ability to fully interpret and utilize it to improve human experiences. Addressing this asymmetry requires novel and revolutionary scientific methods and effective human and artificial intelligence interfaces. By lifting the concept of time from a positive real number to a 2D complex time (kime), this book uncovers a connection between artificial intelligence (AI), data science, and quantum mechanics. It proposes a new mathematical foundation for data science based on raising the 4D spacetime to a higher dimension where longitudinal data (e.g., time-series) are represented as manifolds (e.g., kime-surfaces). This new framework enables the development of innovative data science analytical methods for model-based and model-free scientific inference, derived computed phenotyping, and statistical forecasting. The book provides a transdisciplinary bridge and a pragmatic mechanism to translate quantum mechanical principles, such as particles and wavefunctions, into data science concepts, such as datum and inference-functions.

It includes many open mathematical problems that still need to be solved, technological challenges that need to be tackled, and computational statistics algorithms that have to be fully developed and validated. Spacekime analytics provide mechanisms to effectively handle, process, and interpret large, heterogeneous, and continuously-tracked digital information from multiple sources. The authors propose computational methods, probability model-based techniques, and analytical strategies to estimate, approximate, or simulate the complex time phases (kime directions). This allows transforming time-varying data, such as time-series observations, into higher-dimensional manifolds representing complex-valued and kime-indexed surfaces (kime-surfaces). The book includes many illustrations of model-based and model-free spacekime analytic techniques applied to economic forecasting, identification of functional brain activation, and high-dimensional cohort phenotyping. Specific case-study examples include unsupervised clustering using the Michigan Consumer Sentiment Index (MCSI), model-based inference using functional magnetic resonance imaging (fMRI) data, and model-free inference using the UK Biobank data archive. The material includes mathematical, inferential, computational, and philosophical topics such as Heisenberg uncertainty principle and alternative approaches to large sample theory, where a few spacetime observations can be amplified by a series of derived, estimated, or simulated kime-phases. The authors extend Newton-Leibniz calculus of integration and differentiation to the spacekime manifold and discuss possible solutions to some of the "problems of time". The coverage also includes 5D spacekime formulations of classical 4D spacetime mathematical equations describing natural laws of physics, as well as, statistical articulation of spacekime analytics in a Bayesian inference framework. The steady increase of the volume and complexity of observed and recorded digital information drives the urgent need to develop novel data analytical strategies. Spacekime analytics represents one new data-analytic approach, which provides a mechanism to understand compound phenomena that are observed as multiplex longitudinal processes and computationally tracked by proxy measures. This book may be of interest to academic scholars, graduate students, postdoctoral fellows, artificial intelligence and machine learning engineers, biostatisticians, econometricians, and data analysts. Some of the material may also resonate with philosophers, futurists, astrophysicists, space industry technicians, biomedical researchers, health practitioners, and the general public.

Compact Complex Surfaces - W. Barth 2015-05-22

In the 19 years which passed since the first edition was published, several important developments have taken place in the theory of surfaces. The most sensational one concerns the differentiable structure of surfaces. Twenty years ago very little was known about differentiable structures on 4-manifolds, but in the meantime Donaldson on the one hand and Seiberg and Witten on the other hand, have found, inspired by gauge theory, totally new invariants. Strikingly, together with the theory explained in this book these invariants yield a wealth of new results about the differentiable structure of algebraic surfaces. Other developments include the systematic use of nef-divisors (in accordance with the progress made in the classification of higher dimensional algebraic varieties), a better understanding of Kahler structures on surfaces, and Reid's new approach to adjoint mappings. All these developments have been incorporated in the present edition, though the Donaldson and Seiberg-Witten theory only by way of examples. Of course we use the opportunity to correct some minor mistakes, which we either have discovered ourselves or which were communicated to us by careful readers to whom we are much obliged.

Mathematical Reviews - 2008

Principles and Practices of Interconnection Networks - William James Dally 2004-03-06

One of the greatest challenges faced by designers of digital systems is optimizing the communication and interconnection between system components. Interconnection networks offer an attractive and economical solution to this communication crisis and are fast becoming pervasive in digital systems. Current trends suggest that this communication bottleneck will be even more problematic when designing future generations of machines. Consequently, the anatomy of an interconnection network router and science of interconnection network design will only grow in importance in the coming years. This book offers a detailed and comprehensive presentation of the basic principles of interconnection network design, clearly illustrating them with numerous examples, chapter exercises, and case studies. It incorporates hardware-level descriptions of concepts, allowing a designer to see all the steps of the process from abstract design to concrete implementation. Case studies throughout the book draw on extensive author experience in designing interconnection networks over a period of more than twenty years, providing real world examples of what works, and what doesn't. Tightly couples concepts with implementation costs to facilitate a deeper understanding of the tradeoffs in the design of a practical network. A set of examples and exercises in every chapter help the reader to fully understand all the implications of every design decision.

Interconnection Networks - Jose Duato 2003

Foreword -- Foreword to the First Printing -- Preface -- Chapter 1 -- Introduction -- Chapter 2 -- Message Switching Layer -- Chapter 3 -- Deadlock, Livelock, and Starvation -- Chapter 4 -- Routing Algorithms -- Chapter 5 -- CollectiveCommunicationSupport -- Chapter 6 -- Fault-Tolerant Routing -- Chapter 7 -- Network Architectures -- Chapter 8 -- Messaging Layer Software -- Chapter 9 -- Performance Evaluation -- Appendix A -- Formal Definitions for Deadlock Avoidance -- Appendix B -- Acronyms -- References -- Index.

Network Information Theory - Abbas El Gamal 2011-12-08

This comprehensive treatment of network information theory and its applications provides the first unified coverage of both classical and recent results. With an approach that balances the introduction of new models and new coding techniques, readers are guided through Shannon's point-to-point information theory, single-hop networks, multihop networks, and extensions to distributed computing, secrecy, wireless communication, and networking. Elementary mathematical tools and techniques are used throughout, requiring only basic knowledge of probability, whilst unified proofs of coding theorems are based on a few simple lemmas, making the text accessible to newcomers. Key topics covered include successive cancellation and superposition coding, MIMO wireless communication, network coding, and cooperative relaying. Also covered are feedback and interactive communication, capacity approximations and scaling laws, and asynchronous and random access channels. This book is ideal for use in the classroom, for self-study, and as a reference for researchers and engineers in industry and academia.

Non-complete Algebraic Surfaces - M. Miyanishi 2006-11-15

Topology of Metric Spaces - S. Kumaresan 2005

"Topology of Metric Spaces gives a very streamlined development of a course in metric space topology emphasizing only the most useful concepts, concrete spaces and geometric ideas to encourage geometric thinking, to treat this as a

preparatory ground for a general topology course, to use this course as a surrogate for real analysis and to help the students gain some perspective of modern analysis." "Eminently suitable for self-study, this book may also be used as a supplementary text for courses in general (or point-set) topology so that students will acquire a lot of concrete examples of spaces and maps."--BOOK JACKET.

Basic Algebraic Topology - Anant R. Shastri 2016-02-03

Building on rudimentary knowledge of real analysis, point-set topology, and basic algebra, Basic Algebraic Topology provides plenty of material for a two-semester course in algebraic topology. The book first introduces the necessary fundamental concepts, such as relative homotopy, fibrations and cofibrations, category theory, cell complexes, and si

Glucocorticoid Signaling - Jen-Chywan Wang 2015-07-27

This timely volume provides a comprehensive overview of glucocorticoids and their role in regulating many aspects of physiology and their use in the treatment of disease. The book is broken into four sections that begin by giving a general introduction to glucocorticoids and a brief history of the field. The second section will discuss the effects of glucocorticoids on metabolism, while the third section will cover the effects of glucocorticoids on key tissues. The final section will discuss general topics, such as animal models in glucocorticoid research and clinical implications of glucocorticoid research. Featuring chapters from leaders in the field, this volume will be of interest to both researchers and clinicians.

Introduction to Topology - Colin Conrad Adams 2008

Learn the basics of point-set topology with the understanding of its real-world application to a variety of other subjects including science, economics, engineering, and other areas of mathematics. Introduces topology as an important and fascinating mathematics discipline to retain the readers interest in the subject. Is written in an accessible way for readers to understand the usefulness and importance of the application of topology to other fields. Introduces topology concepts combined with their real-world application to subjects such DNA, heart stimulation, population modeling, cosmology, and computer graphics. Covers topics including knot theory, degree theory, dynamical systems and chaos, graph theory, metric spaces, connectedness, and compactness. A useful reference for readers wanting an intuitive introduction to topology.

Principles of Topology - Fred H. Croom 2016-02-17

Originally published: Philadelphia: Saunders College Publishing, 1989; slightly corrected.

Differential Topology - Morris W. Hirsch 2012-12-06

"A very valuable book. In little over 200 pages, it presents a well-organized and surprisingly comprehensive treatment of most of the basic material in differential topology, as far as is accessible without the methods of algebraic topology....There is an abundance of exercises, which supply many beautiful examples and much interesting additional information, and help the reader to become thoroughly familiar with the material of the main text." -MATHEMATICAL REVIEWS

A Century of Advancing Mathematics - Paul Zorn 2015-08-23

The MAA was founded in 1915 to serve as a home for The American Mathematical Monthly. The mission of the Association-to advance mathematics, especially at the collegiate level-has, however, always been larger than merely publishing world-class mathematical exposition. MAA members have explored more than just mathematics; we have, as this volume tries to make evident, investigated mathematical connections to pedagogy, history, the arts, technology, literature, every field of intellectual endeavor. Essays, all commissioned for this volume, include exposition by Bob Devaney, Robin Wilson, and Frank Morgan; history from Karen Parshall, Della Dumbaugh, and Bill Dunham; pedagogical discussion from Paul Zorn, Joe Gallian, and Michael Starbird, and cultural commentary from Bonnie Gold, Jon Borwein, and Steve Abbott. This volume contains 35 essays by all-star writers and expositors writing to celebrate an extraordinary century for mathematics-more mathematics has been created and published since 1915 than in all of previous recorded history. We've solved age-old mysteries, created entire new fields of study, and changed our conception of what mathematics is. Many of those stories are told in this volume as the contributors paint a portrait of the broad cultural sweep of mathematics during the MAA's first century. Mathematics is the most thrilling, the most human, area of intellectual inquiry; you will find in this volume compelling proof of that claim.

An Invitation to Knot Theory - Heather A. Dye 2018-09-03

The Only Undergraduate Textbook to Teach Both Classical and Virtual Knot Theory An Invitation to Knot Theory: Virtual and Classical gives advanced undergraduate students a gentle introduction to the field of virtual knot theory and mathematical research. It provides the foundation for students to research knot theory and read journal articles on their own. Each chapter includes numerous examples, problems, projects, and suggested readings from research papers. The proofs are written as simply as possible using combinatorial approaches, equivalence classes, and linear algebra. The text begins with an introduction to virtual knots and counted invariants. It then covers the normalized f-polynomial (Jones polynomial) and other skein invariants before discussing algebraic invariants, such as the quandle and biquandle. The book concludes with two applications of virtual knots: textiles and quantum computation.