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# Elements Of Logic Via Numbers And Sets

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A First Course in Discrete Mathematics

Sets, Logic and Categories

Basic Stochastic Processes

Information and Coding Theory

An Introduction to Continuum Models

Metric Spaces

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Numbers And Sets*

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## **AYDIN ZAYNE**

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### **A First Course in Discrete**

**Mathematics** Elements of Logic via  
Numbers and Sets

The theory of groups is simultaneously a branch of abstract algebra and the study of symmetry. Designed for readers approaching the subject for the first time, this book reviews all the essentials. It recaps the basic definitions and results, including Lagrange's Theorem, the isomorphism theorems and group actions.

Later chapters include material on chain conditions and finiteness conditions, free groups and the theory of presentations. In addition, a novel chapter of "entertainments" demonstrates an assortment of results that can be achieved with the theoretical machinery.

*Sets, Logic and Categories* Springer  
Science & Business Media

This book provides readers with the tools needed to understand the physical basis of special relativity and will enable a confident mathematical understanding of Minkowski's picture of space-time. It features a large number of examples and

exercises, ranging from the rather simple through to the more involved and challenging. Coverage includes acceleration and tensors and has an emphasis on space-time diagrams.

**Basic Stochastic Processes** Springer  
Science & Business Media

Pressley assumes the reader knows the main results of multivariate calculus and concentrates on the theory of the study of surfaces. Used for courses on surface geometry, it includes interesting and in-depth examples and goes into the subject in great detail and vigour. The book will cover three-dimensional Euclidean space

only, and takes the whole book to cover the material and treat it as a subject in its own right.

Information and Coding Theory Springer Science & Business Media

This book offers a first taste of the theory of Lie groups, focusing mainly on matrix groups: closed subgroups of real and complex general linear groups. The first part studies examples and describes classical families of simply connected compact groups. The second section introduces the idea of a lie group and explores the associated notion of a homogeneous space using orbits of smooth actions. The emphasis throughout is on accessibility.

**An Introduction to Continuum Models** Springer Science & Business Media

A clear and structured introduction to the subject. After a chapter on the definition of rings and modules there are brief accounts of Artinian rings, commutative Noetherian rings and ring constructions, such as the direct product, Tensor product and rings of fractions, followed by a description of free rings. Readers are assumed to have a basic understanding of set theory, group theory and vector spaces. Over two

hundred carefully selected exercises are included, most with outline solutions.

**Metric Spaces** Springer Science & Business Media

Stochastic processes are tools used widely by statisticians and researchers working in the mathematics of finance. This book for self-study provides a detailed treatment of conditional expectation and probability, a topic that in principle belongs to probability theory, but is essential as a tool for stochastic processes. The book centers on exercises as the main means of explanation.

**Real Analysis** Springer Science & Business Media

This text provides a lively introduction to pure mathematics. It begins with sets, functions and relations, proof by induction and contradiction, complex numbers, vectors and matrices, and provides a brief introduction to group theory. It moves onto analysis, providing a gentle introduction to epsilon-delta technology and finishes with continuity and functions. The book features numerous exercises of varying difficulty throughout the text.

**Essential Topology** Springer Science & Business Media

Vector calculus is the fundamental language of mathematical physics. It provides a way to describe physical quantities in three-dimensional space and the way in which these quantities vary. Many topics in the physical sciences can be analysed mathematically using the techniques of vector calculus. These topics include fluid dynamics, solid mechanics and electromagnetism, all of which involve a description of vector and scalar quantities in three dimensions. This book assumes no previous knowledge of vectors. However, it is assumed that the reader has a knowledge of basic calculus, including differentiation, integration and partial differentiation. Some knowledge of linear algebra is also required, particularly the concepts of matrices and determinants. The book is designed to be self-contained, so that it is suitable for a programme of individual study. Each of the eight chapters introduces a new topic, and to facilitate understanding of the material, frequent reference is made to physical applications. The physical nature of the subject is clarified with over sixty diagrams, which provide an important aid to the comprehension of the new

concepts. Following the introduction of each new topic, worked examples are provided. It is essential that these are studied carefully, so that a full understanding is developed before moving ahead. Like much of mathematics, each section of the book is built on the foundations laid in the earlier sections and chapters.

Springer Science & Business Media

This book brings the most important aspects of modern topology within reach of a second-year undergraduate student. It successfully unites the most exciting aspects of modern topology with those that are most useful for research, leaving readers prepared and motivated for further study. Written from a thoroughly modern perspective, every topic is introduced with an explanation of why it is being studied, and a huge number of examples provide further motivation. The book is ideal for self-study and assumes only a familiarity with the notion of continuity and basic algebra.

### **Sturm-Liouville Theory and its**

**Applications** Springer Science & Business Media

An undergraduate-level introduction to

number theory, with the emphasis on fully explained proofs and examples. Exercises, together with their solutions are integrated into the text, and the first few chapters assume only basic school algebra. Elementary ideas about groups and rings are then used to study groups of units, quadratic residues and arithmetic functions with applications to enumeration and cryptography. The final part, suitable for third-year students, uses ideas from algebra, analysis, calculus and geometry to study Dirichlet series and sums of squares. In particular, the last chapter gives a concise account of Fermat's Last Theorem, from its origin in the ancient Babylonian and Greek study of Pythagorean triples to its recent proof by Andrew Wiles.

*Elementary Number Theory* Springer Science & Business Media

This text is an elementary introduction to information and coding theory. The first part focuses on information theory, covering uniquely decodable and instantaneous codes, Huffman coding, entropy, information channels, and Shannon's Fundamental Theorem. In the second part, linear algebra is used to

construct examples of such codes, such as the Hamming, Hadamard, Golay and Reed-Muller codes. Contains proofs, worked examples, and exercises.

Vector Calculus Springer Science & Business Media

" ... many eminent scholars, endowed with great geometric talent, make a point of never disclosing the simple and direct ideas that guided them, subordinating their elegant results to abstract general theories which often have no application outside the particular case in question. Geometry was becoming a study of algebraic, differential or partial differential equations, thus losing all the charm that comes from its being an art." H. Lebesgue, *Ler;ons sur les Constructions Geometriques*, Gauthier Villars, Paris, 1949. This book is based on lecture courses given to final-year students at the University of Nottingham and to M.Sc. students at the University of the West Indies in an attempt to reverse the process of expurgation of the geometry component from the mathematics curricula of universities. This erosion is in sharp contrast to the situation in research mathematics, where the ideas and

methods of geometry enjoy ever-increasing influence and importance. In the other direction, more modern ideas have made a forceful and beneficial impact on the geometry of the ancients in many areas. Thus trigonometry has vastly clarified our concept of angle, calculus has revolutionised the study of plane curves, and group theory has become the language of symmetry.

**General Relativity** Springer Science & Business Media

Basic Linear Algebra is a text for first year students leading from concrete examples to abstract theorems, via tutorial-type exercises. More exercises (of the kind a student may expect in examination papers) are grouped at the end of each section. The book covers the most important basics of any first course on linear algebra, explaining the algebra of matrices with applications to analytic geometry, systems of linear equations, difference equations and complex numbers. Linear equations are treated via Hermite normal forms which provides a successful and concrete explanation of the notion of linear independence. Another important highlight is the connection

between linear mappings and matrices leading to the change of basis theorem which opens the door to the notion of similarity. This new and revised edition features additional exercises and coverage of Cramer's rule (omitted from the first edition). However, it is the new, extra chapter on computer assistance that will be of particular interest to readers: this will take the form of a tutorial on the use of the "LinearAlgebra" package in MAPLE 7 and will deal with all the aspects of linear algebra developed within the book.

**Matrix Groups** Springer Science & Business Media

Focusing on the manipulation and representation of geometrical objects, this book explores the application of geometry to computer graphics and computer-aided design (CAD). Over 300 exercises are included, some new to this edition, and many of which encourage the reader to implement the techniques and algorithms discussed through the use of a computer package with graphing and computer algebra capabilities. A dedicated website also offers further resources and useful links.

**Topics in Group Theory** Springer

Science & Business Media

Real Analysis is a comprehensive introduction to this core subject and is ideal for self-study or as a course textbook for first and second-year undergraduates. Combining an informal style with precision mathematics, the book covers all the key topics with fully worked examples and exercises with solutions. All the concepts and techniques are deployed in examples in the final chapter to provide the student with a thorough understanding of this challenging subject. This book offers a fresh approach to a core subject and manages to provide a gentle and clear introduction without sacrificing rigour or accuracy.

*Introductory Mathematics: Algebra and Analysis* Springer Science & Business Media

Elements of Logic via Numbers and Sets Springer Science & Business Media  
Elements of Abstract Analysis Springer Science & Business Media

Based on a course taught for years at Oxford, this book offers a concise exposition of the central ideas of general relativity. The focus is on the chain of reasoning that leads to the relativistic

theory from the analysis of distance and time measurements in the presence of gravity, rather than on the underlying mathematical structure. Includes links to recent developments, including theoretical work and observational evidence, to encourage further study.

*Hyperbolic Geometry* Springer Science & Business Media

This book provides the higher-level reader with a comprehensive review of all important aspects of Differential Calculus, Integral Calculus and Geometric Calculus of several variables. The revised edition, which includes additional exercises and expanded solutions, and gives a solid description of the basic concepts via simple familiar examples which are then tested in technically demanding situations. Readers will gain a deep understanding of the uses and limitations of multivariate

calculus.

### **Multivariate Calculus and Geometry**

Springer Science & Business Media

Set theory, logic and category theory lie at the foundations of mathematics, and have a dramatic effect on the mathematics that we do, through the Axiom of Choice, Gödel's Theorem, and the Skolem Paradox. But they are also rich mathematical theories in their own right, contributing techniques and results to working mathematicians such as the Compactness Theorem and module categories. The book is aimed at those who know some mathematics and want to know more about its building blocks. Set theory is first treated naively an axiomatic treatment is given after the basics of first-order logic have been introduced. The discussion is supported by a wide range of exercises. The final chapter touches on

philosophical issues. The book is supported by a World Wide Web site containing a variety of supplementary material.

*A Course Through Exercises* Springer Science & Business Media

The abstract concepts of metric spaces are often perceived as difficult. This book offers a unique approach to the subject which gives readers the advantage of a new perspective on ideas familiar from the analysis of a real line. Rather than passing quickly from the definition of a metric to the more abstract concepts of convergence and continuity, the author takes the concrete notion of distance as far as possible, illustrating the text with examples and naturally arising questions. Attention to detail at this stage is designed to prepare the reader to understand the more abstract ideas with relative ease.

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