An Introduction To The Mathematics Of Financial Derivatives Second Edition

Thirty years ago mathematical, as opposed to applied numerical, computation was difficult to perform and so relatively little used. Three threads changed that: the emergence of the personal computer; the discovery of fiber-optics and the consequent development of the modern internet; and the building of the Three “M’s” Maple, Mathematica and Matlab. We intend to persuade that Maple and other like tools are worth knowing assuming only that one wishes to be a mathematician, a mathematics educator, a computer scientist, an engineer or scientist, or anyone else who wishes/needs to use mathematics better. We also hope to explain how to become an `experimental mathematician' while learning to be better at proving things. To accomplish this our material is divided into three main chapters followed by a postscript. These cover elementary number theory, calculus of one and several variables, introductory linear algebra, and visualization and interactive geometric computation.

Bond and Keane explicate the elements of logical, mathematical argument to elucidate the meaning and importance of mathematical rigor. With definitions of concepts at their disposal, students learn the rules of logical inference, read and understand proofs of theorems, and write their own proofs all while becoming familiar with the grammar of mathematics and its style. In addition, they will develop an appreciation of the different methods of proof (contradiction, induction), the value of a proof, and the beauty of an elegant argument. The authors emphasize that mathematics is an ongoing, vibrant disciplineits long, fascinating history continually intersects with territory still uncharted and questions still in need of answers. The authors extensive background in teaching mathematics shines through in this balanced, explicit, and engaging text, designed as a primer for higher- level mathematics courses. They elegantly demonstrate process and application and recognize the byproducts of both the achievements and the missteps of past thinkers. Chapters 1-5 introduce the fundamentals of abstract mathematics and chapters 6-8 apply the ideas and techniques, placing the earlier material in a real context. Readers interest is continually piqued by the use of clear explanations, practical examples, discussion and discovery exercises, and historical comments.

Classical logic is traditionally introduced by itself, but that makes it seem arbitrary and unnatural. This text introduces classical alongside several nonclassical logics (relevant, constructive, quantative, paraconsistent).

A rigorous introduction to the mathematics of pricing, construction and hedging of derivative securities.

In case you are considering to adopt this book for courses with over 50 students, please contact ties.nijssen@springer.com for more information. This introduction to mathematical logic starts with propositional calculus and first-order logic. Topics covered include syntax, semantics, soundness, completeness, independence, normal forms, vertical paths through negation normal formulas, compactness, Smullyan's Unifying Principle, natural deduction, cut-elimination, semantic tableaux, Skolemization, Herbrand's Theorem, unification, duality, interpolation, and definability. The last three chapters of the book provide an introduction to type theory (higher-order logic). It is shown how various mathematical concepts can be formalized in this very expressive formal language. This expressive notation facilitates proofs of the classical incompleteness and undecidability theorems which are very elegant and easy to understand. The discussion of semantics makes clear the important distinction between standard and nonstandard models which is so important in understanding puzzling phenomena such as the incompleteness theorems and Skolem's Paradox about countable models of set theory. Some of the numerous exercises require giving formal proofs. A computer program called ETPS which is available from the web facilitates doing and checking such exercises. Audience: This volume will be of interest to mathematicians, computer scientists, and philosophers in universities, as well as to computer scientists in industry who wish to use higher-order logic for hardware and software specification and verification.

For problems that require extensive computation, a C++ program can race through billions of examples faster than most other computing choices. C++ enables mathematicians of virtually any discipline to create programs to meet their needs quickly, and is available on most computer systems at no cost. C++ for Mathematicians: An Introduction for Students and Professionals accentuates C++ concepts that are most valuable for pure and applied mathematical research. This is the first book available on C++ programming that is written specifically for a mathematical audience; it omits the language’s more obscure features in favor of the aspects of greatest utility for mathematical work. The author explains how to use C++ to formulate conjectures, create images and diagrams, verify proofs, build mathematical structures, and explore myriad examples. Emphasizing the essential role of practice as part of the learning process, the book is ideally designed for undergraduate coursework as well as self-study. Each chapter provides many problems and solutions which complement the text and enable you to learn quickly how to apply them to your own problems. Accompanying downloadable resources provide all numbered programs so that readers can easily use or adapt the code as needed. Presenting clear explanations and examples from the world of mathematics that develop concepts from the ground up, C++ for Mathematicians can be used again and again as a resource for applying C++ to problems that range from the basic to the complex.

At the intersection of mathematics, computer science, and philosophy, mathematical logic examines the power and limitations of formal mathematical thinking. In this expansion of Leary's user-friendly 1st edition, readers with no previous study in the field are introduced to the basics of model theory, proof theory, and computability theory. The text is designed to be used either in an upper division undergraduate classroom, or for self study. Updating the 1st Edition's treatment of languages, structures, and deductions, leading to rigorous proofs of Godel's First and Second Incompleteness Theorems, the expanded 2nd Edition includes a new introduction to incompleteness through computability as well as solutions to selected exercises.

This introductory text explores 1st- and 2nd-order differential equations, series solutions, the Laplace transform, difference equations, much more. Numerous figures, problems with solutions, notes. 1994 edition. Includes 268 figures and 23 tables.

This textbook provides an introduction to elementary category theory, with the aim of making what can be a confusing and sometimes overwhelming subject more accessible. In writing about this challenging subject, the author has brought to bear all of the experience he has gained in authoring over 30 books in university-level mathematics. The goal of this book is to present the five major ideas of category theory: categories, functors, natural transformations, universality, and adjoints in as friendly and relaxed a manner as possible while at the same time not sacrificing rigor. These topics are developed in a straightforward, step-by-step manner and are accompanied by numerous examples and exercises, most of which are drawn from abstract algebra. The first chapter of the book introduces the definitions of category and functor and discusses diagrams,duality, initial and terminal objects, special types of morphisms, and some special types of categories,particularly comma categories and hom-set categories. Chapter 2 is devoted to functors and naturaltransformations, concluding with Yoneda's lemma. Chapter 3 presents the concept of universality and Chapter 4 continues this discussion by exploring cones, limits, and the most common categorical constructions – products, equalizers, pullbacks and exponentials (along with their dual constructions). The chapter concludes with a theorem on the existence of limits. Finally, Chapter 5 covers adjoints and adjunctions. Graduate and advanced undergraduates students in mathematics, computer science, physics, or related fields who need to know or use category theory in their work will find An Introduction to Category Theory to be a concise and accessible resource. It will be particularly useful for those looking for a more elementary treatment of the topic before tackling more advanced texts.

This introduction to the philosophy of mathematics focuses on contemporary debates in an important and central area of philosophy. The reader is taken on a fascinating and entertaining journey through some intriguing mathematical and philosophical territory, including such topics as the realism/anti-realism debate in mathematics, mathematical explanation, the limits of mathematics, the significance of mathematical notation, inconsistent mathematics and the applications of mathematics. Each chapter has a number of discussion questions and recommended further reading from both the contemporary literature and older sources. Very little mathematical background is assumed and all of the mathematics encountered is clearly introduced and explained using a wide variety of examples. The book is suitable for an undergraduate course in philosophy of mathematics and, more widely, for anyone interested in philosophy and mathematics.

A Classroom-Tested, Alternative Approach to Teaching Math for Liberal Arts Puzzles, Paradoxes, and Problem Solving: An Introduction to Mathematical Thinking uses puzzles and paradoxes to introduce basic principles of mathematical thought. The text is designed for students in liberal arts mathematics courses. Decision-making situations that progress

Basic Mathematics teaches you all the maths you need for everyday situations. If you are terrified by maths, this is the book for you. Do you shy away from using numbers? Basic Mathematics can help. An easy-to-follow guide, it will ensure you gain the confidence you need to tackle maths and overcome your fears. It offers simple explanations of all the key areas, including decimals, percentages, measurements and graphs, and applies them to everyday situations, games and puzzles to help you understand mathematics quickly and enjoyably. Everything you need is here in this one book. Each chapter includes clear explanations, worked examples and test questions. At the end of the book there are challenges and games to give you new and interesting ways to practise your new skills.

This text provides essential modeling skills and methodology for the study of infectious diseases through a one-semester modeling course or directed individual studies. The book includes mathematical descriptions of epidemiological concepts, and uses classic epidemic models to introduce different mathematical methods in model analysis. Matlab codes are also included for numerical implementations. It is primarily written for upper undergraduate and beginning graduate students in mathematical sciences who have an interest in mathematical modeling of infectious diseases. Although written in a rigorous mathematical manner, the style is not unfriendly to non-mathematicians.

Examines the history and development of mathematical concepts and how the contemporary student may use them

Keith Devlin. You know him. You've read his columns in MAA Online, you've heard him on the radio, and you've seen his popular mathematics books. In between all those activities and his own research, he's been hard at work revising Sets, Functions and Logic, his standard-setting text that has smoothed the road to pure mathematics for legions of undergraduate students. Now in its third edition, Devlin has fully reworked the book to reflect a new generation. The narrative is more lively and less textbook-like. Remarks and asides link the topics presented to the real world of students' experience. The chapter on complex numbers and the discussion of formal symbolic logic are gone in favor of more exercises, and a new introductory chapter on the nature of mathematics--one that motivates readers and sets the stage for the challenges that lie ahead. Students crossing the bridge from calculus to higher mathematics need and deserve all the help they can get. Sets, Functions, and Logic, Third Edition is an affordable little book that all of your transition-course students not only can afford, but will actually read...and enjoy...and learn from. About the Author Dr. Keith Devlin is Executive Director of Stanford University's Center for the Study of Language and Information and a Consulting Professor of Mathematics at Stanford. He has written 23 books, one interactive book on CD-ROM, and over 70 published research articles. He is a Fellow of the American Association for the Advancement of Science, a World Economic Forum Fellow, and a former member of the Mathematical Sciences Education Board of the National Academy of Sciences,. Dr. Devlin is also one of the world's leading popularizers of mathematics. Known as "The Math Guy" on NPR's Weekend Edition, he is a frequent contributor to other local and national radio and TV shows in the US and Britain, writes a monthly column for the Web journal MAA Online, and regularly writes on mathematics and computers for the British newspaper The Guardian.

A modern approach to mathematical modeling, featuring unique applications from the field of mechanics An Introduction to Mathematical Modeling: A Course in Mechanics is designed to survey the mathematical models that form the foundations of modern science and incorporates examples that illustrate how the most successful models arise from basic principles in modern and classical mathematical physics. Written by a world authority on mathematical theory and computational mechanics, the book presents an account of continuum mechanics, electromagnetic field theory, quantum mechanics, and statistical mechanics for readers with varied backgrounds in engineering, computer science, mathematics, and physics. The author streamlines a comprehensive understanding of the topic in three clearly organized sections: Nonlinear Continuum Mechanics introduces kinematics as well as force and stress in deformable bodies; mass and momentum; balance of linear and angular momentum; conservation of energy; and constitutive equations Electromagnetic Field Theory and Quantum Mechanics contains a brief account of electromagnetic wave theory and Maxwell's equations as well as an introductory account of quantum mechanics with related topics including ab initio methods and Spin and Pauli's principles Statistical Mechanics presents an introduction to statistical mechanics of systems in thermodynamic equilibrium as well as continuum mechanics, quantum mechanics, and molecular dynamics Each part of the book concludes with exercise sets that allow readers to test their understanding of the presented material. Key theorems and fundamental equations are highlighted throughout, and an extensive bibliography outlines resources for further study. Extensively class-tested to ensure an accessible presentation, An Introduction to Mathematical Modeling is an excellent book for courses on introductory mathematical modeling and statistical mechanics at the upper-undergraduate and graduate levels. The book also serves as a valuable reference for professionals working in the areas of modeling and simulation, physics, and computational engineering.

This is a textbook for an undergraduate mathematics major transition course from technique-based mathematics (such as Algebra and Calculus) to proof-based mathematics. It motivates the introduction of the formal language of logic and set theory and develops the basics with examples, exercises with solutions and exercises without. It then moves to a discussion of proof structure and basic proof techniques, including proofs by induction with extensive examples. An in-depth treatment of relations, particularly equivalence and order relations completes the exposition of the basic language of mathematics. The last chapter treats infinite cardinalities. An appendix gives some complement on induction and order, and another provides full solutions of the in-text exercises. The primary audience is undergraduate mathematics major, but independent readers interested in mathematics can also use the book for self-study.

This book covers tutorial and research contributions on the use of dynamical systems and stochastic models in disease dynamics. Beginning graduate students in applied mathematics, scientists, or mathematicians who want to enter the fields of mathematical and theoretical epidemiology will find this book useful.

Statistics is the science that focuses on drawing conclusions from data, by modeling and analyzing the data using probabilistic models. In An Introduction to Mathematical Statistics the authors describe key concepts from statistics and give a mathematical basis for important statistical methods. Much attention is paid to the sound application of those methods to data. The three main topics in statistics are estimators, tests, and confidence regions. The authors illustrate these in many examples, with a separate chapter on regression models, including linear regression and analysis of variance. They also discuss the optimality of estimators and tests, as well as the selection of the best-fitting model. Each chapter ends with a case study in which the described statistical methods are applied. This book assumes a basic knowledge of probability theory, calculus, and linear algebra.

This book takes the reader from the end of introductory Lie group theory to the threshold of infinite-dimensional group representations. Merging algebra and analysis throughout, the author uses Lie-theoretic methods to develop a beautiful theory having wide applications in mathematics and physics. The book initially shares insights that make use of actual matrices; it later relies on such structural features as properties of root systems.

Based on lectures given at Claremont McKenna College, this text constitutes a substantial, abstract introduction to linear algebra. The presentation emphasizes the structural elements over the computational - for example by connecting matrices to linear transformations from the outset - and prepares the student for further study of abstract mathematics. Uniquely among algebra texts at this level, it introduces group theory early in the discussion, as an example of the rigorous development of informal axiomatic systems.

Bertrand Russell is probably the most important philosopher of mathematics in the 20th century. He brought together his formidable knowledge of the subject and skills as a gifted communicator to provide a classic introduction to the philosophy of mathematics.

This book is an introduction to mathematical biology for students with no experience in biology, but who have some mathematical background. The work is focused on population dynamics and ecology, following a tradition that goes back to Lotka and Volterra, and includes a part devoted to the spread of infectious diseases, a field where mathematical modeling is extremely popular. These themes are used as the area where to understand different types of mathematical modeling and the possible meaning of qualitative agreement of modeling with data. The book also includes a collections of problems designed to approach more advanced questions. This material has been used in the courses at the University of Trento, directed at students in their fourth year of studies in Mathematics. It can also be used as a reference as it provides up-to-date developments in several areas.

Stephen Cole Kleene was one of the greatest logicians of the twentieth century and this book is the influential textbook he wrote to teach the subject to the next generation. It was first published in 1952, some twenty years after the publication of Godel's paper on the incompleteness of arithmetic, which marked, if not the beginning of modern logic. The 1930s was a time of creativity and ferment in the subject, when the notion of computable moved from the realm of philosophical speculation to the realm of science. This was accomplished by the work of Kurt Gode1, Alan Turing, and Alonzo Church, who gave three apparently different precise definitions of computable. When they all turned out to be equivalent, there was a collective realization that this was indeed the right notion. Kleene played a key role in this process. One could say that he was there at the beginning of modern logic. He showed the equivalence of lambda calculus with Turing machines and with Godel's recursion equations, and developed the modern machinery of partial recursive functions. This textbook played an invaluable part in educating the logicians of the present. It played an important role in their own logical education."

An Introduction to MathematicsNew York : Oxford University Press, 1958 [c1948]

This is an undergraduate textbook on the basic aspects of personal savings and investing with a balanced mix of mathematical rigor and economic intuition. It uses routine financial calculations as the motivation and basis for tools of elementary real analysis rather than taking the latter as given. Proofs using induction, recurrence relations and proofs by contradiction are covered. Inequalities such as the Arithmetic-Geometric Mean Inequality and the Cauchy-Schwarz Inequality are used. Basic topics in probability and statistics are presented. The student is introduced to elements of saving and investing that are of life-long practical use. These include savings and checking accounts, certificates of deposit, student loans, credit cards, mortgages, buying and selling bonds, and buying and selling stocks. The book is self contained and accessible. The authors follow a systematic pattern for each chapter including a variety of examples and exercises ensuring that the student deals with realities, rather than theoretical idealizations. It is suitable for courses in mathematics, investing, banking, financial engineering, and related topics.

Games and elections are fundamental activities in society with applications in economics, political science, and sociology. These topics offer familiar, current, and lively subjects for a course in mathematics. This classroom-tested textbook, primarily intended for a general education course in game theory at the freshman or sophomore level, provides an elementary treatment of games and elections. Starting with basics such as gambling, zero-sum and combinatorial games, Nash equilibria, social dilemmas, and fairness and impossibility theorems for elections, the text then goes further into the theory with accessible proofs of advanced topics such as the Sprague–Grundy theorem and Arrow's impossibility theorem. • Uses an integrative approach to probability, game, and social choice theory • Provides a gentle introduction to the logic of mathematical proof, thus equipping readers with the necessary tools for further mathematical studies • Contains numerous exercises and examples of varying levels of difficulty • Requires only a high school mathematical background.

Mathematical Biology is a richly illustrated textbook in an exciting and fast growing field. Providing an in-depth look at the practical use of math modeling, it features exercises throughout that are drawn from a variety of bioscientific disciplines - population biology, developmental biology, physiology, epidemiology, and evolution, among others. It maintains a consistent level throughout so that graduate students can use it to gain a foothold into this dynamic research area.

Accessible text features over 100 reality-based examples pulled from the science, engineering and operations research fields. Prerequisites: ordinary differential equations, continuous probability. Numerous references. Includes 27 black-and-white figures. 1978 edition.

Maths for Geoscientists is an accessible, student-friendly introduction to the essential mathematics required by those students taking degree courses within the Geosciences. Clearly structured throughout, this book carefully guides the student step by step through the mathematics they will encounter and will provide numerous applied examples throughout to enhance students understanding and to place each technique into context. Opening with a chapter explaining the need for studying mathematics within geosciences the book then moves on to cover algebra, equations, solutions, logarithms and exponentials,

statistics and probability, trigonometry, vectors and calculus. The final chapter helps to bring it all together and provides the students with sample projects to test their knowledge. Worked applied examples are included in each chapter along with applied problem questions which are a mix of straightforward maths questions, word questions (developing maths to words), and more involved questions that involve the manipulation and interpretation of real and synthetic data.

This textbook provides an introduction to financial mathematics and financial engineering for undergraduate students who have completed a three- or four-semester sequence of calculus courses. It introduces the theory of interest, discrete and continuous random variables and probability, stochastic processes, linear programming, the Fundamental Theorem of Finance, option pricing, hedging, and portfolio optimization. This third edition expands on the second by including a new chapter on the extensions of the Black-Scholes model of option pricing and a greater number of exercises at the end of each chapter. More background material and exercises added, with solutions provided to the other chapters, allowing the textbook to better stand alone as an introduction to financial mathematics. The reader progresses from a solid grounding in multivariable calculus through a derivation of the Black-Scholes equation, its solution, properties, and applications. The text attempts to be as self-contained as possible without relying on advanced mathematical and statistical topics. The material presented in this book will adequately prepare the reader for graduate-level study in mathematical finance.

Renowned applied mathematician Gilbert Strang teaches applied mathematics with the clear explanations, examples and insights of an experienced teacher. This book progresses steadily through a range of topics from symmetric linear systems to differential equations to least squares and Kalman filtering and optimization. It clearly demonstrates the power of matrix algebra in engineering problem solving. This is an ideal book (beloved by many readers) for a first course on applied mathematics and a reference for more advanced applied mathematicians. The only prerequisite is a basic course in linear algebra.

An Introduction to the Mathematics of Financial Derivatives is a popular, intuitive text that eases the transition between basic summaries of financial engineering to more advanced treatments that use stochastic calculus. Requiring only a passing knowledge of calculus and probability, it takes readers on a tour of advanced financial engineering. This classic title has been revised by Ali Hirsa, who accentuates its well-known strengths while introducing new subjects, updating others, and bringing new continuity to the whole. Popular with readers because it emphasizes intuition and common sense, An Introduction to the Mathematics of Financial Derivatives remains the only "introductory" text that can appeal to people outside the mathematics and physics communities as it explains the hows and whys of practical finance problems. Facilitates readers' understanding of underlying mathematical and theoretical models by presenting a mixture of theory and applications with hands-on learning Foregrounds an intuitive orientation, breaking up complex mathematics concepts in easy-to-understand notions Encourages use of discrete chapters which can be used as complementary readings on different topics, offering flexibility in learning and teaching

This textbook aims to fill the gap between those that offer a theoretical treatment without many applications and those that present and apply formulas without appropriately deriving them. The balance achieved will give readers a fundamental understanding of key financial ideas and tools that form the basis for building realistic models, including those that may become proprietary. Numerous carefully chosen examples and exercises reinforce the student’s conceptual understanding and facility with applications. The exercises are divided into conceptual, application-based, and theoretical problems, which probe the material deeper. The book is aimed toward advanced undergraduates and first-year graduate students who are new to finance or want a more rigorous treatment of the mathematical models used within. While no background in finance is assumed, prerequisite math courses include multivariable calculus, probability, and linear algebra. The authors introduce additional mathematical tools as needed. The entire textbook is appropriate for a single year-long course on introductory mathematical finance. The self-contained design of the text allows for instructor flexibility in topics courses and those focusing on financial derivatives. Moreover, the text is useful for mathematicians, physicists, and engineers who want to learn finance via an approach that builds their financial intuition and is explicit about model building, as well as business school students who want a treatment of finance that is deeper but not overly theoretical.

Key Message: A History of Mathematics, Third Edition, provides a solid background in the history of mathematics, helping readers gain a deeper understanding of mathematical concepts in their historical context. This book's global perspective covers how contributions from Chinese, Indian, and Islamic mathematicians shaped our modern understanding of mathematics. This book also includes discussions of important historical textbooks and primary sources to help readers further understand the development of modern mathematics. Key Topics: Ancient Mathematics: Egypt and Mesopotamia, The Beginnings of Mathematics in Greece, Euclid, Archimedes and Apollonius, Mathematical Methods in Hellenistic Times, The Final Chapter of Greek Mathematics; Medieval Mathematics: Ancient and Medieval China, Ancient and Medieval India, The Mathematics of Islam, Medieval Europe, Mathematics Elsewhere; Early Modern Mathematics: Algebra in the Renaissance, Mathematical Methods in the Renaissance, Geometry, Algebra and Probability in the Seventeenth Century, The Beginnings of Calculus, Newton and Leibniz; Modern Mathematics: Analysis in the Eighteenth Century, Probability and Statistics in the Eighteenth Century, Algebra and Number Theory in the Eighteenth Century, Geometry in the Eighteenth Century, Algebra and Number Theory in the Nineteenth Century, Analysis in the Nineteenth Century, Probability and Statistics in the Nineteenth Century, Geometry in the Nineteenth Century, Aspects of the Twentieth Century Market: For all readers interested in the history of mathematics.

In a mathematically precise manner, this book presents a unified introduction to deterministic control theory. It includes material on the realization of both linear and nonlinear systems, impulsive control, and positive linear systems.