By Gregory F Lawler Introduction To Stochastic Processes Chapman Hallcrc Probability Series 1st Frist Edition Hardcover

Focusing on the mathematics that lies at the intersection of probability theory, statistical physics, combinatorics and computer science, this volume collects together lecture notes on recent developments in the area. The common ground of these subjects is perhaps best described by the three terms in the title: Random Walks, Random Fields and Disordered Systems. The specific topics covered include a study of Branching Brownian Motion from the perspective of disordered (spin-glass) systems, a detailed analysis of weakly self-avoiding random walks in four spatial dimensions via methods of field theory and the renormalization group, a study of phase transitions in disordered discrete structures using a rigorous version of the cavity method, a survey of recent work on interacting polymers in the ballisticity regime and, finally, a treatise on two-dimensional loop-soup models and their connection to conformally invariant systems and the Gaussian Free Field. The notes are aimed at early graduate students with a modest background in probability and mathematical physics, although they could also be enjoyed by seasoned researchers

interested in learning about recent advances in the above fields.

Die jüngsten Entwicklungen zeigen, dass sich Wahrscheinlichkeitsverfahren zu einem sehr wirkungsvollen Werkzeug entwickelt haben, und das auf so unterschiedlichen Gebieten wie statistische Physik, dynamische Systeme, Riemann'sche Geometrie, Gruppentheorie, harmonische Analyse, Graphentheorie und Informatik.

This text is designed for an introductory probability course at the university level for sophomores, juniors, and seniors in mathematics, physical and social sciences, engineering, and computer science. It presents a thorough treatment of ideas and techniques necessary for a firm understanding of the subject. The text is also recommended for use in discrete probability courses. The material is organized so that the discrete and continuous probability discussions are presented in a separate, but parallel, manner. This organization does not emphasize an overly rigorous or formal view of probability and therefore offers some strong pedagogical value. Hence, the discrete discussions can sometimes serve to motivate the more abstract continuous probability discussions. Features: Key ideas are developed in a somewhat leisurely style, providing a variety of interesting applications to probability and showing some nonintuitive ideas. Over 600 exercises provide the opportunity for

practicing skills and developing a sound understanding of ideas. Numerous historical comments deal with the development of discrete probability. The text includes many computer programs that illustrate the algorithms or the methods of computation for important problems. The book is a beautiful introduction to probability theory at the beginning level. The book contains a lot of examples and an easy development of theory without any sacrifice of rigor, keeping the abstraction to a minimal level. It is indeed a valuable addition to the study of probability theory. --Zentralblatt MATH Following the publication of the Japanese edition of this book, several inter esting developments took place in the area. The author wanted to describe some of these, as well as to offer suggestions concerning future problems which he hoped would stimulate readers working in this field. For these reasons, Chapter 8 was added. Apart from the additional chapter and a few minor changes made by the author, this translation closely follows the text of the original Japanese edition. We would like to thank Professor J. L. Doob for his helpful comments on the English edition. T. Hida T. P. Speed v Preface The physical phenomenon described by Robert Brown was the complex and erratic motion of grains of pollen suspended in a liquid. In the many years which have passed since this description, Brownian motion has become an object of study in pure as

well as applied mathematics. Even now many of its important properties are being discovered, and doubtless new and useful aspects remain to be discovered. We are getting a more and more intimate understanding of Brownian motion.

"How much of our fate is tied to the status of our parents and grandparents? How much does this influence our children? More than we wish to believe! While it has been argued that rigid class structures have eroded in favor of greater social equality, The Son Also Rises proves that movement on the social ladder has changed little over eight centuries. Using a novel technique -- tracking family names over generations to measure social mobility across countries and periods -- renowned economic historian Gregory Clark reveals that mobility rates are lower than conventionally estimated, do not vary across societies, and are resistant to social policies. The good news is that these patterns are driven by strong inheritance of abilities and lineage does not beget unwarranted advantage. The bad news is that much of our fate is predictable from lineage. Clark argues that since a greater part of our place in the world is predetermined, we must avoid creating winner-take-all societies."--Jacket.

This book is an introduction to the modern approach to the theory of Markov chains. The main goal of this approach is to determine the rate of convergence of a Markov chain to the stationary distribution as a

function of the size and geometry of the state space. The authors develop the key tools for estimating convergence times, including coupling, strong stationary times, and spectral methods. Whenever possible, probabilistic methods are emphasized. The book includes many examples and provides brief introductions to some central models of statistical mechanics. Also provided are accounts of random walks on networks, including hitting and cover times, and analyses of several methods of shuffling cards. As a prerequisite, the authors assume a modest understanding of probability theory and linear algebra at an undergraduate level. Markov Chains and Mixing Times is meant to bring the excitement of this active area of research to a wide audience. Linear and nonlinear waves are a central part of the theory of PDEs. This book begins with a description of one-dimensional waves and their visualization through computer-aided techniques. Next, traveling waves are covered, such as solitary waves for the Klein-Gordon and KdV equations. Finally, the author gives a lucid discussion of waves arising from conservation laws, including shock and rarefaction waves. As an application, interesting models of traffic flow are used to illustrate conservation laws and wave phenomena. This book is based on a course given by the author at the IAS/Park City Mathematics Institute. It is suitable for independent study by undergraduate students in mathematics,

engineering, and science programs. This book is published in cooperation with IAS/Park City Mathematics Institute.

This book brings a reader to the cutting edge of several important directions of the contemporary probability theory, which in many cases are strongly motivated by problems in statistical physics. The authors of these articles are leading experts in the field and the reader will get an exceptional panorama of the field from the point of view of scientists who played, and continue to play, a pivotal role in the development of the new methods and ideas, interlinking it with geometry, complex analysis, conformal field theory, etc., making modern probability one of the most vibrant areas in mathematics.

Emphasizing fundamental mathematical ideas rather than proofs, Introduction to Stochastic Processes, Second Edition provides quick access to important foundations of probability theory applicable to problems in many fields. Assuming that you have a reasonable level of computer literacy, the ability to write simple programs, and the access to software for linear algebra computations, the author approaches the problems and theorems with a focus on stochastic processes evolving with time, rather than a particular emphasis on measure theory. For those lacking in exposure to linear differential and difference equations, the author begins with a brief introduction to these concepts. He proceeds to discuss Markov chains, optimal stopping, martingales, and Brownian motion. The book concludes with a chapter on stochastic integration. The author supplies many basic, general

examples and provides exercises at the end of each chapter. New to the Second Edition: Expanded chapter on stochastic integration that introduces modern mathematical finance Introduction of Girsanov transformation and the Feynman-Kac formula Expanded discussion of Itô's formula and the Black-Scholes formula for pricing options New topics such as Doob's maximal inequality and a discussion on self similarity in the chapter on Brownian motion Applicable to the fields of mathematics, statistics, and engineering as well as computer science, economics, business, biological science, psychology, and engineering, this concise introduction is an excellent resource both for students and professionals.

This text provides a thoroughly modern graduate-level introduction to the theory of critical behaviour. It begins with a brief review of phase transitions in simple systems, then goes on to introduce the core ideas of the renormalisation group.

A fascinating exploration of how insights from computer algorithms can be applied to our everyday lives, helping to solve common decision-making problems and illuminate the workings of the human mind All our lives are constrained by limited space and time, limits that give rise to a particular set of problems. What should we do, or leave undone, in a day or a lifetime? How much messiness should we accept? What balance of new activities and familiar favorites is the most fulfilling? These may seem like uniquely human quandaries, but they are not: computers, too, face the same constraints, so computer scientists have been grappling with their version of such issues for decades. And the solutions they've found have much to teach us. In a dazzlingly interdisciplinary work, acclaimed author Brian Christian and cognitive scientist Tom Griffiths show how the algorithms used by computers can also untangle very human questions. They explain how to have better hunches and when to leave things to chance, how to deal with overwhelming choices and how best to

connect with others. From finding a spouse to finding a parking spot, from organizing one's inbox to understanding the workings of memory, Algorithms to Live By transforms the wisdom of computer science into strategies for human living. An excellent introduction for computer scientists and electrical and electronics engineers who would like to have a good, basic understanding of stochastic processes! This clearly written book responds to the increasing interest in the study of systems that vary in time in a random manner. It presents an introductory account of some of the important topics in the theory of the mathematical models of such systems. The selected topics are conceptually interesting and have fruitful application in various branches of science and technology. An Introduction to Stochastic Processes with Applications to Biology, Second Edition presents the basic theory of stochastic processes necessary in understanding and applying stochastic methods to biological problems in areas such as population growth and extinction, drug kinetics, two-species competition and predation, the spread of epidemics, and the genetics of inbreeding. Because of their rich structure, the text focuses on discrete and continuous time Markov chains and continuous time and state Markov processes. New to the Second Edition A new chapter on stochastic differential equations that extends the basic theory to multivariate processes, including multivariate forward and backward Kolmogorov differential equations and the multivariate Itô's formula The inclusion of examples and exercises from cellular and molecular biology Double the number of exercises and MATLAB® programs at the end of each chapter Answers and hints to selected exercises in the appendix Additional references from the literature This edition continues to provide an excellent introduction to the fundamental theory of stochastic processes, along with a wide range of applications from the biological sciences. To

better visualize the dynamics of stochastic processes, MATLAB programs are provided in the chapter appendices.
This is the first book to present in detail the important subject of asymptotic behavior of Painleve transcendents. Authors summarize recent developments in the theory of the six Painleve equations using the Riemann-Hilbert method. Emphasis on explicit formulae content gives this book appeal to users of Painleve functions in mathematics and theoretical physics.
Beyond the introductory ideas, there are many wonderful results in probability that are unfamiliar to laymen, but which are well within their grasp to understand and appreciate. Some of the most remarkable results in probability are related to limit theorems. In this book, the author makes them accessible by stating everything in terms of a game of tossing of a coin: heads or tails. Using this method, the analysis becomes much clearer, helping to establish the reader.s intuition about probability. Moreover, very little generality is lost, as many situations can be modelled from combinations of coin tosses. This book is suitable for anyone who would like to learn more about mathematical probability and has had a one-year undergraduate course in analysis
The heat equation can be derived by averaging over a very large number of particles. Traditionally, the resulting PDE is studied as a deterministic equation, an approach that has brought many significant results and a deep understanding of the equation and its solutions. By studying the heat equation and considering the individual random particles, however, one gains further intuition into the problem. While this is now standard for many researchers, this approach is generally not presented at the undergraduate level. In this book, Lawler introduces the heat equations and the closely related notion of harmonic functions from a probabilistic perspective. The theme of the first two chapters of the book is the relationship

between random walks and the heat equation. This first chapter discusses the discrete case, random walk and the heat equation on the integer lattice; and the second chapter discusses the continuous case, Brownian motion and the usual heat equation. Relationships are shown between the two. For example, solving the heat equation in the discrete setting becomes a problem of diagonalization of symmetric matrices, which becomes a problem in Fourier series in the continuous case. Random walk and Brownian motion are introduced and developed from first principles. The latter two chapters discuss different topics: martingales and fractal dimension, with the chapters tied together by one example, a random Cantor set. The idea of this book is to merge probabilistic and deterministic approaches to heat flow. It is also intended as a bridge from undergraduate analysis to graduate and research perspectives. The book is suitable for advanced undergraduates, particularly those considering graduate work in mathematics or related areas.

Building upon the previous editions, this textbook is a first course in stochastic processes taken by undergraduate and graduate students (MS and PhD students from math, statistics, economics, computer science, engineering, and finance departments) who have had a course in probability theory. It covers Markov chains in discrete and continuous time, Poisson processes, renewal processes, martingales, and option pricing. One can only learn a subject by seeing it in action, so there are a large number of examples and more than 300 carefully chosen exercises to deepen the reader's understanding. Drawing from teaching experience and student

feedback, there are many new examples and problems with solutions that use TI-83 to eliminate the tedious details of solving linear equations by hand, and the collection of exercises is much improved, with many more biological examples. Originally included in previous editions, material too advanced for this first course in stochastic processes has been eliminated while treatment of other topics useful for applications has been expanded. In addition, the ordering of topics has been improved; for example, the difficult subject of martingales is delayed until its usefulness can be applied in the treatment of mathematical finance.

As humans face defeat at the hands of the alien Fallers, four Earth dwellers travel deep into space to test a theory, and hopefully defeat their enemy, in the epic conclusion of the Probability Trilogy, which began with Probability Moon and Probability Sun. Reprint.

A central study in Probability Theory is the behavior of fluctuation phenomena of partial sums of different types of random variable. One of the most useful concepts for this purpose is that of the random walk which has applications in many areas, particularly in statistical physics and statistical chemistry. Originally published in 1991, Intersections of Random Walks focuses on and explores a number of problems dealing primarily with the nonintersection of random walks and the self-avoiding walk. Many of these

problems arise in studying statistical physics and other critical phenomena. Topics include: discrete harmonic measure, including an introduction to diffusion limited aggregation (DLA); the probability that independent random walks do not intersect; and properties of walks without self-intersections. The present softcover reprint includes corrections and addenda from the 1996 printing, and makes this classic monograph available to a wider audience. With a self-contained introduction to the properties of simple random walks, and an emphasis on rigorous results, the book will be useful to researchers in probability and statistical physics and to graduate students interested in basic properties of random walks.

Linear Algebra offers a unified treatment of both matrix-oriented and theoretical approaches to the course, which will be useful for classes with a mix of mathematics, physics, engineering, and computer science students. Major topics include singular value decomposition, the spectral theorem, linear systems of equations, vector spaces, linear maps, matrices, eigenvalues and eigenvectors, linear independence, bases, coordinates, dimension, matrix factorizations, inner products, norms, and determinants.

This volume describes the current state of knowledge of random spatial processes, particularly those arising in physics. The emphasis is on survey articles which describe areas of current interest to

probabilists and physicists working on the probability theory of phase transition. Special attention is given to topics deserving further research. The principal contributions by leading researchers concern the mathematical theory of random walk, interacting particle systems, percolation, Ising and Potts models, spin glasses, cellular automata, quantum spin systems, and metastability. The level of presentation and review is particularly suitable for postgraduate and postdoctoral workers in mathematics and physics, and for advanced specialists in the probability theory of spatial disorder and phase transition.

This classroom-tested textbook is an introduction to probability theory, with the right balance between mathematical precision, probabilistic intuition, and concrete applications. Introduction to Probability covers the material precisely, while avoiding excessive technical details. After introducing the basic vocabulary of randomness, including events, probabilities, and random variables, the text offers the reader a first glimpse of the major theorems of the subject: the law of large numbers and the central limit theorem. The important probability distributions are introduced organically as they arise from applications. The discrete and continuous sides of probability are treated together to emphasize their similarities. Intended for students with a calculus background, the text teaches not only the nuts and

bolts of probability theory and how to solve specific problems, but also why the methods of solution work.

In the last 200 years, harmonic analysis has been one of the most influential bodies of mathematical ideas, having been exceptionally significant both in its theoretical implications and in its enormous range of applicability throughout mathematics, science, and engineering. In this book, the authors convey the remarkable beauty and applicability of the ideas that have grown from Fourier theory. They present for an advanced undergraduate and beginning graduate student audience the basics of harmonic analysis, from Fourier's study of the heat equation, and the decomposition of functions into sums of cosines and sines (frequency analysis), to dyadic harmonic analysis, and the decomposition of functions into a Haar basis (time localization). While concentrating on the Fourier and Haar cases, the book touches on aspects of the world that lies between these two different ways of decomposing functions: time-frequency analysis (wavelets). Both finite and continuous perspectives are presented, allowing for the introduction of discrete Fourier and Haar transforms and fast algorithms, such as the Fast Fourier Transform (FFT) and its wavelet analogues. The approach combines rigorous proof, inviting motivation, and numerous applications. Over 250 exercises are included in the text. Each chapter ends

with ideas for projects in harmonic analysis that students can work on independently. This book is published in cooperation with IAS/Park City Mathematics Institute.

Theoretical physicists have predicted that the scaling limits of many two-dimensional lattice models in statistical physics are in some sense conformally invariant. This belief has allowed physicists to predict many quantities for these critical systems. The nature of these scaling limits has recently been described precisely by using one well-known tool, Brownian motion, and a new construction, the Schramm-Loewner evolution (SLE). This book is an introduction to the conformally invariant processes that appear as scaling limits. The following topics are covered: stochastic integration; complex Brownian motion and measures derived from Brownian motion; conformal mappings and univalent functions; the Loewner differential equation and Loewner chains; the Schramm-Loewner evolution (SLE), which is a Loewner chain with a Brownian motion input; and applications to intersection exponents for Brownian motion. The prerequisites are first-year graduate courses in real analysis, complex analysis, and probability. The book is suitable for graduate students and research mathematicians interested in random processes and their applications in theoretical physics.

Set theory can be considered a unifying theory for

mathematics. This book covers the fundamentals of the subject.

Over the last fifteen years fractal geometry has established itself as a substantial mathematical theory in its own right. The interplay between fractal geometry, analysis and stochastics has highly influenced recent developments in mathematical modeling of complicated structures. This process has been forced by problems in these areas related to applications in statistical physics, biomathematics and finance. This book is a collection of survey articles covering many of the most recent developments, like Schramm-Loewner evolution, fractal scaling limits, exceptional sets for percolation, and heat kernels on fractals. The authors were the keynote speakers at the conference "Fractal Geometry and Stochastics IV" at Greifswald in September 2008.

Explains the fundamental theory and mathematics of water and wastewater treatment processes By carefully explaining both the underlying theory and the underlying mathematics, this text enables readers to fully grasp the fundamentals of physical and chemical treatment processes for water and wastewater. Throughout the book, the authors use detailed examples to illustrate real-world challenges and their solutions, including step-by-step mathematical calculations. Each chapter ends with a set of problems that enable readers to put their knowledge into practice by developing and analyzing complex processes for the removal of soluble and particulate materials in order to ensure the safety of our water supplies. Designed to give readers a deep understanding of how water treatment processes actually

work, Water Quality Engineering explores: Application of mass balances in continuous flow systems, enabling readers to understand and predict changes in water quality Processes for removing soluble contaminants from water, including treatment of municipal and industrial wastes Processes for removing particulate materials from water Membrane processes to remove both soluble and particulate materials Following the discussion of mass balances in continuous flow systems in the first part of the book, the authors explain and analyze water treatment processes in subsequent chapters by setting forth the relevant mass balance for the process, reactor geometry, and flow pattern under consideration. With its many examples and problem sets, Water Quality Engineering is recommended as a textbook for graduate courses in physical and chemical treatment processes for water and wastewater. By drawing together the most recent research findings and industry practices, this text is also recommended for professional environmental engineers in search of a contemporary perspective on water and wastewater treatment processes.

Introduction to Stochastic ProcessesCRC Press

Based on lectures and computer labs held at the IAS/Park City Mathematics Institute, this book presents areas of current research in modern probability that are accessible to undergraduate students. The subjects include: random walks, Brownian motion, card shuffling, spanning trees, and Markov chain Monte Carlo. There are computer simulations for random walks, Markov chains, stochastic differential equations as applied to

finance, and other topics.
wide criticism both from Western and Eastern scholars.
In combinatorics, one often considers the process of enumerating objects of a certain nature, which results in a sequence of positive integers. With each such sequence, one can associate a generating function, whose properties tell us a lot about the nature of the objects being enumerated. Nowadays, the language of generating functions is the main language of enumerative combinatorics. This book is based on the course given by the author at the College of Mathematics of the Independent University of Moscow. It starts with definitions, simple properties, and numerous examples of generating functions. It then discusses various topics, such as formal grammars, generating functions in several variables, partitions and decompositions, and the exclusion-inclusion principle. In the final chapter, the author describes applications of generating functions to enumeration of trees, plane graphs, and graphs embedded in two-dimensional surfaces. Throughout the book, the reader is motivated by interesting examples rather than by general theories. It also contains a lot of exercises to help the reader master the material. Little beyond the standard calculus course is necessary to understand the book. It can serve as a text for a one-semester undergraduate course in combinatorics.
This book presents a concise treatment of stochastic calculus and its applications. It gives a simple but rigorous treatment of the subject including a range of advanced topics, it is useful for practitioners who use advanced theoretical results. It covers advanced

applications, such as models in mathematical finance, biology and engineering.Self-contained and unified in presentation, the book contains many solved examples and exercises. It may be used as a textbook by advanced undergraduates and graduate students in stochastic calculus and financial mathematics. It is also suitable for practitioners who wish to gain an understanding or working knowledge of the subject. For mathematicians, this book could be a first text on stochastic calculus; it is good companion to more advanced texts by a way of examples and exercises. For people from other fields, it provides a way to gain a working knowledge of stochastic calculus. It shows all readers the applications of stochastic calculus methods and takes readers to the technical level required in research and sophisticated modelling.This second edition contains a new chapter on bonds, interest rates and their options. New materials include more worked out examples in all chapters, best estimators, more results on change of time, change of measure, random measures, new results on exotic options, FX options, stochastic and implied volatility, models of the age-dependent branching process and the stochastic Lotka-Volterra model in biology, non-linear filtering in engineering and five new figures.Instructors can obtain slides of the text from the author.

This volume is a collection of lecture notes for six of the ten courses given in Buzios, Brazil by prominent probabilists at the 2010 Clay Mathematics Institute Summer School, ``Probability and Statistical Physics in Two and More Dimensions'' and at the XIV Brazilian School of Probability. In

the past ten to fifteen years, various areas of probability theory related to statistical physics, disordered systems and combinatorics have undergone intensive development. A number of these developments deal with two-dimensional random structures at their critical points, and provide new tools and ways of coping with at least some of the limitations of Conformal Field Theory that had been so successfully developed in the theoretical physics community to understand phase transitions of two-dimensional systems. Included in this selection are detailed accounts of all three foundational courses presented at the Clay school--Schramm-Loewner Evolution and other Conformally Invariant Objects, Noise Sensitivity and Percolation, Scaling Limits of Random Trees and Planar Maps--together with contributions on Fractal and Multifractal properties of SLE and Conformal Invariance of Lattice Models. Finally, the volume concludes with extended articles based on the courses on Random Polymers and Self-Avoiding Walks given at the Brazilian School of Probability during the final week of the school. Together, these notes provide a panoramic, state-of-the-art view of probability theory areas related to statistical physics, disordered systems and combinatorics. Like the lectures themselves, they are oriented towards advanced students and postdocs, but experts should also find much of interest.

'Mind-blowing. It kept me guessing from the beginning to the end' Reader review * * * * * The pitch-black bestselling psychological thriller for fans of Friend Request by Laura Marshall and I Am Watching You by Teresa Driscoll. Alex Taylor wakes up tied to an operating table. The man who stands over her isn't a doctor. The choice he forces her to make is utterly unspeakable. But when Alex re-awakens, she's unharmed - and no one believes her horrifying story. Ostracised by her colleagues, her family and her partner, she begins to wonder if she really is losing her mind. And then

she meets the next victim. So compulsive you can't stop reading. So chilling you won't stop talking about it. Don't Wake Up is a dark, gripping psychological thriller with a horrifying premise and a stinging twist . . . Readers are completely gripped by Don't Wake Up: 'A gripping read right up to the end . . . fast-paced, well written and exciting' * * * * * 'Full of twists . . . one of the best books I've read in a while' * * * * * 'A perfect balance of suspense, drama, crime and mystery. A superbly executed book I could not stop reading!' * * * * * 'Couldn't put it down' * * * * * 'An outstanding debut novel' * * * * * 'One of my favourite reads this year' * * * * * 'Gripping, fascinating, slightly terrifying, and moved at a quick pace. Overall a great psychological thriller' * * * * * 'This is a fantastic novel that will hook you right in and leave you suspecting every single charachter' * * * * *

This work thoroughly covers the concepts and main results of probability theory, from its fundamental principles to advanced applications. This edition provides examples early in the text of practical problems such as the safety of a piece of engineering equipment or the inevitability of wrong conclusions in seemingly accurate medical tests for AIDS and cancer.;College or university bookstores may order five or more copies at a special student price which is available upon request from Marcel Dekker, Inc.

Asymptotics in one form or another are part of the landscape for every mathematician. The objective of this book is to present the ideas of how to approach asymptotic problems that arise in discrete mathematics, analysis of algorithms, and number theory. A broad range of topics is covered, including distribution of prime integers, Erd?s Magic, random graphs, Ramsey numbers, and asymptotic geometry. The author is a disciple of Paul Erd?s, who taught him about Asymptopia. Primes less than , graphs with vertices, random walks of steps--Erd?s was fascinated by the limiting behavior as the

variables approached, but never reached, infinity.
Asymptotics is very much an art. The various functions , , , , all have distinct personalities. Erd?s knew these functions as personal friends. It is the author's hope that these insights may be passed on, that the reader may similarly feel which function has the right temperament for a given task. This book is aimed at strong undergraduates, though it is also suitable for particularly good high school students or for graduates wanting to learn some basic techniques. Asymptopia is a beautiful world. Enjoy!

Presents an introduction to the conformally invariant processes that appear as scaling limits. This book covers such topics as stochastic integration, and complex Brownian motion and measures derived from Brownian motion. It is suitable for those interested in random processes and their applications in theoretical physics.

The modern subject of mathematical finance has undergone considerable development, both in theory and practice, since the seminal work of Black and Scholes appeared a third of a century ago. This book is intended as an introduction to some elements of the theory that will enable students and researchers to go on to read more advanced texts and research papers. The book begins with the development of the basic ideas of hedging and pricing of European and American derivatives in the discrete (i.e., discrete time and discrete state) setting of binomial tree models. Then a general discrete finite market model is introduced, and the fundamental theorems of asset pricing are proved in this setting. Tools from probability such as conditional expectation, filtration, (super)martingale, equivalent martingale measure, and martingale representation are all used first in this simple discrete framework. This provides a bridge to the continuous (time and state) setting, which requires the additional concepts of Brownian motion and

stochastic calculus. The simplest model in the continuous setting is the famous Black-Scholes model, for which pricing and hedging of European and American derivatives are developed. The book concludes with a description of the fundamental theorems for a continuous market model that generalizes the simple Black-Scholes model in several directions.

This text balances accessibility and rigor in teaching stochastic calculus to advanced undergraduate and graduate students in mathematics, economics, and finance. Avoiding the measure-theoretic formalism, the author presents the material in a natural order and keeps technical ideas to a minimum. Any technical material is covered in sections that are separate from the main text. Students are encouraged to write computer programs using C++, MATLAB®, or Mathematica®.

Random walks are stochastic processes formed by successive summation of independent, identically distributed random variables and are one of the most studied topics in probability theory. This contemporary introduction evolved from courses taught at Cornell University and the University of Chicago by the first author, who is one of the most highly regarded researchers in the field of stochastic processes. This text meets the need for a modern reference to the detailed properties of an important class of random walks on the integer lattice. It is suitable for probabilists, mathematicians working in related fields, and for researchers in other disciplines who use random walks in modeling.