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Trends and Perspectives in Applied Mathematics

This book treats stochastic motion in nonlinear oscillator systems. It describes a rapidly growing field of nonlinear mechanics with applications to a number of areas in science and engineering, including astronomy, plasma physics, statistical mechanics and hydrodynamics. The main emphasis is on intrinsic stochasticity in Hamiltonian systems, where the stochastic motion is generated by the dynamics itself and not by external noise. However, the effects of noise in modifying the intrinsic motion are also considered. A thorough introduction to chaotic motion in dissipative systems is given in the final chapter. Although the roots of the field are old, dating back to the last century when Poincare and others attempted to formulate a theory for nonlinear perturbations of planetary orbits, it was new mathematical results obtained in the 1960's, together with computational results obtained using high speed computers, that facilitated our new treatment of the subject. Since the new methods partly originated in mathematical advances, there have been two or three mathematical monographs exposing these developments. However,

these monographs employ methods and language that are not readily accessible to scientists and engineers, and also do not give explicit techniques for making practical calculations. In our treatment of the material, we emphasize physical insight rather than mathematical rigor. We present practical methods for describing the motion, for determining the transition from regular to stochastic behavior, and for characterizing the stochasticity. We rely heavily on numerical computations to illustrate the methods and to validate them.

Asymptotic Analysis

The volume presents a selection of in-depth studies and state-of-the-art surveys of several challenging topics that are at the forefront of modern applied mathematics, mathematical modeling, and computational science. These three areas represent the foundation upon which the methodology of mathematical modeling and computational experiment is built as a ubiquitous tool in all areas of mathematical applications. This book covers both fundamental and applied research, ranging from studies of elliptic curves over finite fields with their applications to cryptography, to dynamic blocking problems, to random matrix theory with its innovative applications. The book provides the reader with state-of-the-art achievements in the development and application of new theories at the interface of applied mathematics, modeling, and computational science. This book aims at fostering interdisciplinary collaborations required to meet the modern

challenges of applied mathematics, modeling, and computational science. At the same time, the contributions combine rigorous mathematical and computational procedures and examples from applications ranging from engineering to life sciences, providing a rich ground for graduate student projects.

Statistical and Computational Inverse Problems

The idea for this book was conceived by the authors some time in 1988, and a first outline of the manuscript was drawn up during a summer school on mathematical physics held in Ravello in September 1988, where all three of us were present as lecturers or organizers. The project was in some sense inherited from our friend Marvin Shinbrot, who had planned a book about recent progress for the Boltzmann equation, but, due to his untimely death in 1987, never got to do it. When we drew up the first outline, we could not anticipate how long the actual writing would stretch out. Our ambitions were high: We wanted to cover the modern mathematical theory of the Boltzmann equation, with rigorous proofs, in a complete and readable volume. As the years progressed, we withdrew to some degree from this first ambition- there was just too much material, too scattered, sometimes incomplete, sometimes not rigorous enough. However, in the writing process itself, the need for the book became ever more apparent. The last twenty years have seen an amazing number of significant results in the field, many of them published in incomplete form,

sometimes in obscure places, and sometimes without technical details. We made it our objective to collect these results, classify them, and present them as best we could. The choice of topics remains, of course, subjective.

Mathematical Geoscience

Regular and Stochastic Motion

Mathematical Geoscience is an expository textbook which aims to provide a comprehensive overview of a number of different subjects within the Earth and environmental sciences. Uniquely, it treats its subjects from the perspective of mathematical modelling with a level of sophistication that is appropriate to their proper investigation. The material ranges from the introductory level, where it can be used in undergraduate or graduate courses, to research questions of current interest. The chapters end with notes and references, which provide an entry point into the literature, as well as allowing discursive pointers to further research avenues. The introductory chapter provides a condensed synopsis of applied mathematical techniques of analysis, as used in modern applied mathematical modelling. There follows a succession of chapters on climate, ocean and atmosphere dynamics, rivers, dunes, landscape formation, groundwater flow, mantle convection, magma transport, glaciers and ice sheets, and sub-glacial floods. This book introduces a whole range of important geoscientific topics in one single

volume and serves as an entry point for a rapidly expanding area of genuine interdisciplinary research. By addressing the interplay between mathematics and the real world, this book will appeal to graduate students, lecturers and researchers in the fields of applied mathematics, the environmental sciences and engineering.

Variational Methods for Structural Optimization

FOAM. This acronym has been used for over 70 years at Rensselaer to designate an upper-division course entitled, Foundations of Applied Mathematics. This course was started by George Handelman in 1956, when he came to Rensselaer from the Carnegie Institute of Technology. His objective was to closely integrate mathematical and physical reasoning, and in the process enable students to obtain a qualitative understanding of the world we live in. FOAM was soon taken over by a young faculty member, Lee Segel. About this time a similar course, Introduction to Applied Mathematics, was introduced by Chia-Ch'iao Lin at the Massachusetts Institute of Technology. Together Lin and Segel, with help from Handelman, produced one of the landmark textbooks in applied mathematics, Mathematics Applied to Deterministic Problems in the Natural Sciences. This was originally published in 1974, and republished in 1988 by the Society for Industrial and Applied Mathematics, in their Classics Series. This textbook comes from the author teaching FOAM over the last few years. In this sense, it is an updated version of the Lin and Segel

textbook.

Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields

In this book we have developed the asymptotic analysis of nonlinear dynamical systems. We have collected a large number of results, scattered throughout the literature and presented them in a way to illustrate both the underlying common theme, as well as the diversity of problems and solutions. While most of the results are known in the literature, we added new material which we hope will also be of interest to the specialists in this field. The basic theory is discussed in chapters two and three. Improved results are obtained in chapter four in the case of stable limit sets. In chapter five we treat averaging over several angles; here the theory is less standardized, and even in our simplified approach we encounter many open problems. Chapter six deals with the definition of normal form. After making the somewhat philosophical point as to what the right definition should look like, we derive the second order normal form in the Hamiltonian case, using the classical method of generating functions. In chapter seven we treat Hamiltonian systems. The resonances in two degrees of freedom are almost completely analyzed, while we give a survey of results obtained for three degrees of freedom systems. The appendices contain a mix of elementary results, expansions on the theory and research problems.

Parallel Processing and Applied Mathematics

This book covers the statistical mechanics approach to computational solution of inverse problems, an innovative area of current research with very promising numerical results. The techniques are applied to a number of real world applications such as limited angle tomography, image deblurring, electrical impedance tomography, and biomagnetic inverse problems. Contains detailed examples throughout and includes a chapter on case studies where such methods have been implemented in biomedical engineering.

Artificial Intelligence and Applied Mathematics in Engineering Problems

This book is a revised and updated version, including a substantial portion of new material, of J. D. Cole's text *Perturbation Methods in Applied Mathematics*, Ginn-Blaisdell, 1968. We present the material at a level which assumes some familiarity with the basics of ordinary and partial differential equations. Some of the more advanced ideas are reviewed as needed; therefore this book can serve as a text in either an advanced undergraduate course or a graduate level course on the subject. The applied mathematician, attempting to understand or solve a physical problem, very often uses a perturbation procedure. In doing this, he usually draws on a backlog of experience gained from the solution of similar examples rather than on some general theory of perturbations. The

aim of this book is to survey these perturbation methods, especially in connection with differential equations, in order to illustrate certain general features common to many examples. The basic ideas, however, are also applicable to integral equations, integrodifferential equations, and even to difference equations. In essence, a perturbation procedure consists of constructing the solution for a problem involving a small parameter B , either in the differential equation or the boundary conditions or both, when the solution for the limiting case $B = 0$ is known. The main mathematical tool used is asymptotic expansion with respect to a suitable asymptotic sequence of functions of B .

Probability Theory

From the Preface: "The material in this book is based on notes for a course which I gave several times at Brown University. The target of the course was juniors and seniors majoring in applied mathematics, engineering and other sciences. My basic goal in the course was to teach standard methods, or what I regard as a basic "bag of tricks". In my opinion the material contained here, for the most part, does not depart widely from traditional subject matter. One such departure is the discussion of discrete linear systems. Besides being interesting in its own right, this topic is included because the treatment of such systems leads naturally to the use of discrete Fourier series, discrete Fourier transforms, and their extension, the Z-transform. On making the transition to continuous systems we derive their continuous

analogues, viz., Fourier series, Fourier transforms, Fourier integrals and Laplace transforms. A main advantage to the approach taken is that a wide variety of techniques are seen to result from one or two very simple but central ideas. Above all, this course is intended as being one which gives the student a "can-do" frame of mind about mathematics. Students should be given confidence in using mathematics and not be made fearful of it. I have, therefore, forgone the theorem-proof format for a more informal style. Finally, a concerted effort was made to present an assortment of examples from diverse applications with the hope of attracting the interest of the student, and an equally dedicated effort was made to be kind to the reader."

Introduction to Applied Mathematics for Environmental Science

This book provides an introduction to the theory of turbulence in fluids based on the representation of the flow by means of its vorticity field. It has long been understood that, at least in the case of incompressible flow, the vorticity representation is natural and physically transparent, yet the development of a theory of turbulence in this representation has been slow. The pioneering work of Onsager and of Joyce and Montgomery on the statistical mechanics of two-dimensional vortex systems has only recently been put on a firm mathematical footing, and the three-dimensional theory remains in parts speculative and even controversial. The first three chapters of the book

contain a reasonably standard introduction to homogeneous turbulence (the simplest case); a quick review of fluid mechanics is followed by a summary of the appropriate Fourier theory (more detailed than is customary in fluid mechanics) and by a summary of Kolmogorov's theory of the inertial range, slanted so as to dovetail with later vortex-based arguments. The possibility that the inertial spectrum is an equilibrium spectrum is raised.

The Energy Method, Stability, and Nonlinear Convection

This text presenting the mathematical theory of finite elements is organized into three main sections. The first part develops the theoretical basis for the finite element methods, emphasizing inf-sup conditions over the more conventional Lax-Milgram paradigm. The second and third parts address various applications and practical implementations of the method, respectively. It contains numerous examples and exercises.

Perturbation Methods in Applied Mathematics

This book treats nonlinear dynamics in both Hamiltonian and dissipative systems. The emphasis is on the mechanics for generating chaotic motion, methods of calculating the transitions from regular to chaotic motion, and the dynamical and statistical properties of the dynamics when it is chaotic. The new edition brings the subject matter in a rapidly

expanding field up to date, and has greatly expanded the treatment of dissipative dynamics to include most important subjects.

Introduction to Applied Mathematics

This book features research presented at the 1st International Conference on Artificial Intelligence and Applied Mathematics in Engineering, held on 20–22 April 2019 at Antalya, Manavgat (Turkey). In today's world, various engineering areas are essential components of technological innovations and effective real-world solutions for a better future. In this context, the book focuses on problems in engineering and discusses research using artificial intelligence and applied mathematics. Intended for scientists, experts, M.Sc. and Ph.D. students, postdocs and anyone interested in the subjects covered, the book can also be used as a reference resource for courses related to artificial intelligence and applied mathematics.

Recent Advances in Pure and Applied Mathematics

An application of the techniques of dynamical systems and bifurcation theories to the study of nonlinear oscillations. Taking their cue from Poincare, the authors stress the geometrical and topological properties of solutions of differential equations and iterated maps. Numerous exercises, some of which require nontrivial algebraic manipulations and computer work, convey the important analytical

underpinnings of problems in dynamical systems and help readers develop an intuitive feel for the properties involved.

The Mathematical Theory of Dilute Gases

The purpose of this book is to provide core material in nonlinear analysis for mathematicians, physicists, engineers, and mathematical biologists. The main goal is to provide a working knowledge of manifolds, dynamical systems, tensors, and differential forms. Some applications to Hamiltonian mechanics, fluid mechanics, electromagnetism, plasma dynamics and control theory are given in Chapter 8, using both invariant and index notation. The current edition of the book does not deal with Riemannian geometry in much detail, and it does not treat Lie groups, principal bundles, or Morse theory. Some of this is planned for a subsequent edition. Meanwhile, the authors will make available to interested readers supplementary chapters on Lie Groups and Differential Topology and invite comments on the book's contents and development. Throughout the text supplementary topics are given, marked with the symbols \sim and $\{|\cdot|\}$. This device enables the reader to skip various topics without disturbing the main flow of the text. Some of these provide additional background material intended for completeness, to minimize the necessity of consulting too many outside references. We treat finite and infinite-dimensional manifolds simultaneously. This is partly for efficiency of exposition. Without advanced applications, using manifolds of mappings, the study of infinite-

dimensional manifolds can be hard to motivate.

Applied Delay Differential Equations

This book addresses key aspects of recent developments in applied mathematical analysis and its use. It also highlights a broad range of applications from science, engineering, technology and social perspectives. Each chapter investigates selected research problems and presents a balanced mix of theory, methods and applications for the chosen topics. Special emphasis is placed on presenting basic developments in applied mathematical analysis, and on highlighting the latest advances in this research area. The book is presented in a self-contained manner as far as possible, and includes sufficient references to allow the interested reader to pursue further research in this still-developing field. The primary audience for this book includes graduate students, researchers and educators; however, it will also be useful for general readers with an interest in recent developments in applied mathematical analysis and applications.

Vorticity and Turbulence

Six new chapters (14-19) deal with topics of current interest: multi-component convection diffusion, convection in a compressible fluid, convection with temperature dependent viscosity and thermal conductivity, penetrative convection, nonlinear stability in ocean circulation models, and numerical solution of eigenvalue problems.

Theory and Practice of Finite Elements

An exposition of the derivation and use of equations of motion for two-phase flow. The approach taken derives the equations of motion using ensemble averaging, and compares them with those derived from control volume methods. Closure for dispersed flows is discussed, and some fundamental solutions are given. The work focuses on the fundamental aspects of two-phase flow, and is intended to give the reader a background for understanding the dynamics as well as a system of equations that can be used in predictions of the behavior of dispersed two-phase flows. The exposition in terms of ensemble averaging is new, and combining it with modern continuum mechanics concepts makes this book unique. Intended for engineering, mathematics and physics researchers and advanced graduate students working in the field.

Averaging Methods in Nonlinear Dynamical Systems

Enlarged, updated, and extensively revised, this second edition illuminates specific problems of nonlinear elasticity, emphasizing the role of nonlinear material response. Opening chapters discuss strings, rods, and shells, and applications of bifurcation theory and the calculus of variations to problems for these bodies. Subsequent chapters cover tensors, three-dimensional continuum mechanics, three-dimensional elasticity, general theories of rods and shells, and dynamical problems. Each chapter includes

interesting, challenging, and tractable exercises.

An Introduction to Bayesian Scientific Computing

This book bridges a gap between a rigorous mathematical approach to variational problems and the practical use of algorithms of structural optimization in engineering applications. The foundations of structural optimization are presented in sufficiently simple form as to make them available for practical use.

Theory of Multicomponent Fluids

In various fields of science, notably in physics and biology, one is confronted with periodic phenomena having a remarkable temporal structure: it is as if certain systems are periodically reset in an initial state. A paper of Van der Pol in the Philosophical Magazine of 1926 started up the investigation of this highly nonlinear type of oscillation for which Van der Pol coined the name "relaxation oscillation". The study of relaxation oscillations requires a mathematical analysis which differs strongly from the well-known theory of almost linear oscillations. In this monograph the method of matched asymptotic expansions is employed to approximate the periodic orbit of a relaxation oscillator. As an introduction, in chapter 2 the asymptotic analysis of Van der Pol's equation is carried out in all detail. The problem exhibits all features characteristic for a relaxation oscillation. From this case study one may learn how to

handle other or more generally formulated relaxation oscillations. In the survey special attention is given to biological and chemical relaxation oscillators. In chapter 2 a general definition of a relaxation oscillation is formulated.

Applied Probability

Applied Delay Differential Equations is a friendly introduction to the fast-growing field of time-delay differential equations. Written to a multi-disciplinary audience, it sets each area of science in his historical context and then guides the reader towards questions of current interest.

Applied Mathematical Analysis: Theory, Methods, and Applications

Homology is a powerful tool used by mathematicians to study the properties of spaces and maps that are insensitive to small perturbations. This book uses a computer to develop a combinatorial computational approach to the subject. The core of the book deals with homology theory and its computation. Following this is a section containing extensions to further developments in algebraic topology, applications to computational dynamics, and applications to image processing. Included are exercises and software that can be used to compute homology groups and maps. The book will appeal to researchers and graduate students in mathematics, computer science, engineering, and nonlinear dynamics.

Introduction to Spectral Theory

Mittag-Leffler Functions, Related Topics and Applications

This book moves systematically through the topic of applied probability from an introductory chapter to such topics as random variables and vectors, stochastic processes, estimation, testing and regression. The topics are well chosen and the presentation is enriched by many examples from real life. Each chapter concludes with many original, solved and unsolved problems and hundreds of multiple choice questions, enabling those unfamiliar with the topics to master them. Additionally appealing are historical notes on the mathematicians mentioned throughout, and a useful bibliography. A distinguishing character of the book is its thorough and succinct handling of the varied topics.

Analysis for Applied Mathematics

From the reviews: "A good introduction to a subject important for its capacity to circumvent theoretical and practical obstacles, and therefore particularly prized in the applications of mathematics. The book presents a balanced view of the methods and their usefulness: integrals on the real line and in the complex plane which arise in different contexts, and solutions of differential equations not expressible as integrals. Murray includes both historical remarks and references to sources or other more complete

treatments. More useful as a guide for self-study than as a reference work, it is accessible to any upperclass mathematics undergraduate. Some exercises and a short bibliography included. Even with E.T. Copson's *Asymptotic Expansions* or N.G. de Bruijn's *Asymptotic Methods in Analysis* (1958), any academic library would do well to have this excellent introduction." (S. Puckette, University of the South) #Choice Sept. 1984#1

Regular and Chaotic Dynamics

This marks the 100th volume to appear in the Applied Mathematical Sciences series. *Partial Differential Equations*, by Fritz John, the first volume of the series, appeared in 1971. One year prior to its appearance, the then mathematics editor of Springer-Verlag, Klaus Peters, organized a meeting to look into the possibility of starting a series slanted toward applications. The meeting took place in New Rochelle, at the home of Fritz and Charlotte John. K.O. Friedrichs, Peter Lax, Monroe Donsker, Joe Keller, and others from the Courant Institute (previously, the Institute for Mathematical Sciences) were present as were Joe LaSalle and myself, the two of us having traveled down from Providence for the meeting. The John home, a large, comfortable house, especially lent itself to the informal, relaxed, and wide-ranging discussion that ensued. What emerged was a consensus that mathematical applications appeared to be poised for a period of growth and that there was a clear need for a series committed to applied mathematics. The first paragraph of the editorial

statement written at that time reads as follows: The mathematization of all sciences, the fading of traditional scientific boundaries, the impact of computer technology, the growing importance of mathematical-computer modeling and the necessity of scientific planning all create the need both in education and research for books that are introductory to and abreast of these developments.

Introduction to the Foundations of Applied Mathematics

The first monograph to treat topological, group-theoretic, and geometric problems of ideal hydrodynamics and magnetohydrodynamics from a unified point of view. It describes the necessary preliminary notions both in hydrodynamics and pure mathematics with numerous examples and figures. The book is accessible to graduates as well as pure and applied mathematicians working in hydrodynamics, Lie groups, dynamical systems, and differential geometry.

Advances in Applied Mathematics, Modeling, and Computational Science

This book constitutes the thoroughly refereed post-proceedings of the 6th International Conference on Parallel Processing and Applied Mathematics, PPAM 2005. The book presents 135 papers organized in topical sections on parallel and distributed architectures, parallel and distributed non-numerical algorithms, performance analysis, prediction and

optimization, grid programming, tools and environments for clusters and grids, applications of parallel/distributed/grid computing, evolutionary computing with applications, parallel data mining, parallel numerics, and mathematical and computing methods.

Analysis and Mathematical Physics

This well-written book contains the analytical tools, concepts, and viewpoints needed for modern applied mathematics. It treats various practical methods for solving problems such as differential equations, boundary value problems, and integral equations. Pragmatic approaches to difficult equations are presented, including the Galerkin method, the method of iteration, Newton's method, projection techniques, and homotopy methods.

Topological Methods in Hydrodynamics

Despite the fears of university mathematics departments, mathematics education is growing rather than declining. But the truth of the matter is that the increases are occurring outside departments of mathematics. Engineers, computer scientists, physicists, chemists, economists, statisticians, biologists, and even philosophers teach and learn a great deal of mathematics. The teaching is not always terribly rigorous, but it tends to be better motivated and better adapted to the needs of students. In my own experience teaching students of biostatistics and mathematical biology, I attempt to convey both the

beauty and utility of probability. This is a tall order, partially because probability theory has its own vocabulary and habits of thought. The axiomatic presentation of advanced probability typically proceeds via measure theory. This approach has the advantage of rigor, but it inevitably misses most of the interesting applications, and many applied scientists rebel against the onslaught of technicalities. In the current book, I endeavor to achieve a balance between theory and applications in a rather short compass. While the combination of brevity and balance sacrifices many of the proofs of a rigorous course, it is still consistent with supplying students with many of the relevant theoretical tools. In my opinion, it is better to present the mathematical facts without proof rather than omit them altogether.

Computational Homology

The intention of this book is to introduce students to active areas of research in mathematical physics in a rather direct way minimizing the use of abstract mathematics. The main features are geometric methods in spectral analysis, exponential decay of eigenfunctions, semi-classical analysis of bound state problems, and semi-classical analysis of resonance. A new geometric point of view along with new techniques are brought out in this book which have both been discovered within the past decade. This book is designed to be used as a textbook, unlike the competitors which are either too fundamental in their approach or are too abstract in nature to be considered as texts. The authors' text fills a gap in the

marketplace.

Manifolds, Tensor Analysis, and Applications

This book has been written for undergraduate and graduate students in various disciplines of mathematics. The authors, internationally recognized experts in their field, have developed a superior teaching and learning tool that makes it easy to grasp new concepts and apply them in practice. The book's highly accessible approach makes it particularly ideal if you want to become acquainted with the Bayesian approach to computational science, but do not need to be fully immersed in detailed statistical analysis.

Nonlinear Problems of Elasticity

Aimed primarily at graduate students and researchers, this text is a comprehensive course in modern probability theory and its measure-theoretical foundations. It covers a wide variety of topics, many of which are not usually found in introductory textbooks. The theory is developed rigorously and in a self-contained way, with the chapters on measure theory interlaced with the probabilistic chapters in order to display the power of the abstract concepts in the world of probability theory. In addition, plenty of figures, computer simulations, biographic details of key mathematicians, and a wealth of examples support and enliven the presentation.

Mathematics and Technology

This book teaches mathematical structures and how they can be applied in environmental science. Each chapter presents story problems with an emphasis on derivation. For each of these, the discussion follows the pattern of first presenting an example of a type of structure as applied to environmental science. The definition of the structure is presented, followed by additional examples using MATLAB, and analytic methods of solving and learning from the structure.

Stability and Transition in Shear Flows

A detailed look at some of the more modern issues of hydrodynamic stability, including transient growth, eigenvalue spectra, secondary instability. It presents analytical results and numerical simulations, linear and selected nonlinear stability methods. By including classical results as well as recent developments in the field of hydrodynamic stability and transition, the book can be used as a textbook for an introductory, graduate-level course in stability theory or for a special-topics fluids course. It is equally of value as a reference for researchers in the field of hydrodynamic stability theory or with an interest in recent developments in fluid dynamics. Stability theory has seen a rapid development over the past decade, this book includes such new developments as direct numerical simulations of transition to turbulence and linear analysis based on the initial-value problem.

Applied Probability and Statistics

As a result of researchers' and scientists' increasing

interest in pure as well as applied mathematics in non-conventional models, particularly those using fractional calculus, Mittag-Leffler functions have recently caught the interest of the scientific community. Focusing on the theory of the Mittag-Leffler functions, the present volume offers a self-contained, comprehensive treatment, ranging from rather elementary matters to the latest research results. In addition to the theory the authors devote some sections of the work to the applications, treating various situations and processes in viscoelasticity, physics, hydrodynamics, diffusion and wave phenomena, as well as stochastics. In particular the Mittag-Leffler functions allow us to describe phenomena in processes that progress or decay too slowly to be represented by classical functions like the exponential function and its successors. The book is intended for a broad audience, comprising graduate students, university instructors and scientists in the field of pure and applied mathematics, as well as researchers in applied sciences like mathematical physics, theoretical chemistry, bio-mathematics, theory of control and several other related areas.

Applied Mathematics and Scientific Computing

This volume is the first of two containing selected papers from the International Conference on Advances in Mathematical Sciences (ICAMS), held at the Vellore Institute of Technology in December 2017. This meeting brought together researchers from around the world to share their work, with the aim of

promoting collaboration as a means of solving various problems in modern science and engineering. The authors of each chapter present a research problem, techniques suitable for solving it, and a discussion of the results obtained. These volumes will be of interest to both theoretical- and application-oriented individuals in academia and industry. Papers in Volume I are dedicated to active and open areas of research in algebra, analysis, operations research, and statistics, and those of Volume II consider differential equations, fluid mechanics, and graph theory.

Asymptotic Methods for Relaxation Oscillations and Applications

This book introduces the student to numerous modern applications of mathematics in technology. The authors write with clarity and present the mathematics in a clear and straightforward way making it an interesting and easy book to read. Numerous exercises at the end of every section provide practice and reinforce the material in the chapter. An engaging quality of this book is that the authors also present the mathematical material in a historical context and not just the practical one. Mathematics and Technology is intended for undergraduate students in mathematics, instructors and high school teachers. Additionally, its lack of calculus centrality as well as a clear indication of the more difficult topics and relatively advanced references make it suitable for any curious individual with a decent command of high school math.

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