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this book is a collection of invited and reviewed chapters on state of the art developments in interdisciplinary mathematics

the book discusses recent developments in the fields of theoretical and applied mathematics covering areas of interest to mathematicians scientists engineers industrialists researchers faculty and students readers will be exposed to topics chosen from a wide range of areas including differential equations integral reforms operational calculus numerical analysis fluid mechanics and computer science the aim of the book is to provide brief and reliably expressed research topics that will enable those new or not aware of mathematical sciences in this part of the world while the book has not been precisely planned to address any branch of mathematics it presents contributions of the relevant topics to do so the topics chosen for the book are those that we have found of significant interest to many researchers in the world these also are topics that are applicable in many fields of computational and applied mathematics this book constitutes the first attempt in jordanian literature to scientifically consider the extensive need of research development at the national and international levels with which mathematics deals the book grew not only from the international collaboration between the authors but rather from the long need for a research based book from different parts of the world for researchers and professionals working in computational and applied mathematics this is the modified version of the back cover content on the print book

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this comprehensive well planned text offers broad coverage and a wide range of examples and problems to meet the various needs of undergraduate engineering mathematics and applied mathematics courses as they evolve in line with changes of emphasis and application essential results and methods are summarized where appropriate to make the material easily accessible the book includes not only the standard problems students might expect but also those that will occur in actual practice when slightly different formulations are involved the main structure of the text follows the generally established pattern of chapter headings for a book on complex analysis but the order in which the topics are presented is unique the approach adopted with this book distinguishes it from other texts in part because of the care that has been taken in how old and new topics are discussed as well as in the interconnections that are established between the chapters

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including their order of presentation students will be able to apply their mathematical knowledge more effectively if they understand the interconnections between different branches of mathematics such as engineering mathematics and applied mathematics

working computationally in applied mathematics is the very essence of dealing with real world problems in science and engineering approximation theory on the borderline between pure and applied mathematics has always supplied some of the most innovative ideas computational methods and original approaches to many types of problems the f

this volume is based on lectures delivered at the 2019 ams short course sum of squares theory and applications held january 14 15 2019 in baltimore maryland this book provides a concise state of the art overview of the theory and applications of polynomials that are sums of squares this is an exciting and timely topic with rich connections to many areas of mathematics including polynomial and semidefinite optimization real and convex algebraic geometry and theoretical computer science the six chapters introduce and survey recent developments in this area specific topics include the algebraic and geometric aspects of sums of squares and spectrahedra lifted representations of convex sets and the algorithmic and computational implications of viewing sums of squares as a meta algorithm the book also showcases practical applications of the techniques across a variety of areas including control theory statistics finance and machine learning

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this book was written as a comprehensive introduction to the theory of ordinary differential equations with a focus on mechanics and dynamical systems as time honored and important applications of this theory his torically these were the applications that spurred the development of the mathematical theory and in hindsight they are still the best applications for illustrating the concepts ideas and impact of the theory while the book is intended for traditional graduate students in mathe matics the material is organized so that the book can also be used in a wider setting within today s modern university and society see ways to use the book below in particular it is hoped that interdisciplinary programs with courses that combine students in mathematics physics engineering and other sciences can benefit from using this text working professionals in any of these fields should be able to profit too by study of this text an important but optional component of the book based on the in structor s or reader s preferences is its computer material the book is one of the few graduate

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differential equations texts that use the computer to enhance the concepts and theory normally taught to first and second year graduate students in mathematics i have made every attempt to blend to gether the traditional theoretical material on differential equations and the new exciting techniques afforded by computer algebra systems cas like maple mathematica or matlab

this book includes research studies novel theory as well as new methodology and applications in mathematics and management sciences the book will provide a comprehensive range of mathematics applied to engineering areas for different tasks it will offer an international perspective and a bridge between classical theory and new methodology in many areas along with real life applications features offers solutions to multi objective transportation problem under cost reliability using utility function presents optimization techniques to support eco efficiency assessment in manufacturing processes covers distance based function approach for optimal design of engineering processes with multiple quality characteristics provides discrete time sliding mode control for non linear networked control systems discusses second law of thermodynamics as instruments for optimizing fluid dynamic systems and aerodynamic systems

in this second book of what will be a four volume series the authors present in a mathematically rigorous way the essential foundations of both the theory and practice of algorithms approximation and optimization essential topics in modern applied and computational mathematics this material is the introductory framework upon which algorithm analysis optimization probability statistics machine learning and control theory are built this text gives a unified treatment of several topics that do not usually appear together the theory and analysis of algorithms for mathematicians and data science students probability and its applications the theory and applications of approximation including fourier series wavelets and polynomial approximation and the theory and practice of optimization including dynamic optimization when used in concert with the free supplemental lab materials foundations of applied mathematics volume 2 algorithms approximation optimization teaches not only the theory but also the computational practice of modern mathematical methods exercises and examples build upon each other in a way that continually reinforces previous ideas allowing students to retain learned concepts while achieving a greater depth the mathematically rigorous lab content guides students to technical proficiency and answers the age old question when am i going to use this this textbook is geared toward advanced undergraduate and beginning graduate students in mathematics data science and machine learning

in order to tackle complex problems in the applied sciences there is an increased demand for interdisciplinary research between mathematicians and researchers working in engineering the sciences and business the mathematical sciences are undergoing rapid changes and the boundaries between them and other disciplines are blurring this volume contains survey articles and general thoughts and views on applied mathematics by the plenary speakers and panelists of a symposium on current and future directions in applied mathematics which was held in the spring of 1996 at the university of notre dame

this book develops an understanding of sophisticated tools by using them complex variable theory is developed the first

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three chapters and selected topics make a nice course this course should appeal to faculty who want an integrated treatment of linear algebra and complex analysis including applications and also reviewing vector analysis s

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

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