

Functional Equations And How To Solve Them 1st Edition

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Functional Equations and Inequalities - John Michael Rassias
2017-03-20

This volume covers the topic in functional equations in a broad sense and is written by authors who are in this field for the past 50 years. It contains the basic notions of functional equations, the methods of solving functional equations, the growth of functional equations in the last four decades and an extensive reference list on fundamental research papers that investigate the stability results of different types of functional equations and functional inequalities. This volume starts by taking the reader from the fundamental ideas to higher levels of results that appear in recent research papers. Its step-by-step expositions are easy for the reader to understand and admire the elegant results and findings on the stability of functional equations. Request Inspection Copy

Functional Equations and How to Solve Them - Christopher G. Small
2007-04-03

Many books have been written on the theory of functional equations, but very few help readers solve functional equations in mathematics competitions and mathematical problem solving. This book fills that gap. Each chapter includes a list of problems associated with the covered

material. These vary in difficulty, with the easiest being accessible to any high school student who has read the chapter carefully. The most difficult will challenge students studying for the International Mathematical Olympiad or the Putnam Competition. An appendix provides a springboard for further investigation of the concepts of limits, infinite series and continuity.

Applied Stochastic Differential Equations - Simo Särkkä 2019-05-02
With this hands-on introduction readers will learn what SDEs are all about and how they should use them in practice.

Regularity Properties of Functional Equations in Several Variables
- Antal Járai 2005-03-03

This book illustrates the basic ideas of regularity properties of functional equations by simple examples. It then treats most of the modern results about regularity of non-composite functional equations of several variables in a unified fashion. A long introduction highlights the basic ideas for beginners and several applications are also included.

Mathematics for Physical Chemistry - Robert G. Mortimer 2005-06-10
Mathematics for Physical Chemistry, Third Edition, is the ideal text for students and physical chemists who want to sharpen their mathematics

skills. It can help prepare the reader for an undergraduate course, serve as a supplementary text for use during a course, or serve as a reference for graduate students and practicing chemists. The text concentrates on applications instead of theory, and, although the emphasis is on physical chemistry, it can also be useful in general chemistry courses. The Third Edition includes new exercises in each chapter that provide practice in a technique immediately after discussion or example and encourage self-study. The first ten chapters are constructed around a sequence of mathematical topics, with a gradual progression into more advanced material. The final chapter discusses mathematical topics needed in the analysis of experimental data. Numerous examples and problems interspersed throughout the presentations Each extensive chapter contains a preview, objectives, and summary Includes topics not found in similar books, such as a review of general algebra and an introduction to group theory Provides chemistry specific instruction without the distraction of abstract concepts or theoretical issues in pure mathematics

Techniques of Functional Analysis for Differential and Integral Equations - Paul Sacks 2017-05-16

Techniques of Functional Analysis for Differential and Integral Equations describes a variety of powerful and modern tools from mathematical analysis, for graduate study and further research in ordinary differential equations, integral equations and partial differential equations. Knowledge of these techniques is particularly useful as preparation for graduate courses and PhD research in differential equations and numerical analysis, and more specialized topics such as fluid dynamics and control theory. Striking a balance between mathematical depth and accessibility, proofs involving more technical aspects of measure and integration theory are avoided, but clear statements and precise alternative references are given . The work provides many examples and exercises drawn from the literature. Provides an introduction to mathematical techniques widely used in applied mathematics and needed for advanced research in ordinary and partial differential equations, integral equations, numerical analysis, fluid dynamics and other areas Establishes the advanced background needed for sophisticated literature

review and research in differential equations and integral equations Suitable for use as a textbook for a two semester graduate level course for M.S. and Ph.D. students in Mathematics and Applied Mathematics

Euclidean Geometry in Mathematical Olympiads - Evan Chen 2021-08-23

This is a challenging problem-solving book in Euclidean geometry, assuming nothing of the reader other than a good deal of courage. Topics covered included cyclic quadrilaterals, power of a point, homothety, triangle centers; along the way the reader will meet such classical gems as the nine-point circle, the Simson line, the symmedian and the mixtilinear incircle, as well as the theorems of Euler, Ceva, Menelaus, and Pascal. Another part is dedicated to the use of complex numbers and barycentric coordinates, granting the reader both a traditional and computational viewpoint of the material. The final part consists of some more advanced topics, such as inversion in the plane, the cross ratio and projective transformations, and the theory of the complete quadrilateral. The exposition is friendly and relaxed, and accompanied by over 300 beautifully drawn figures. The emphasis of this book is placed squarely on the problems. Each chapter contains carefully chosen worked examples, which explain not only the solutions to the problems but also describe in close detail how one would invent the solution to begin with. The text contains a selection of 300 practice problems of varying difficulty from contests around the world, with extensive hints and selected solutions. This book is especially suitable for students preparing for national or international mathematical olympiads or for teachers looking for a text for an honor class.

Topics in Functional Equations - Titu Andreescu 2020-01-15

On Functions and Functional Equations - J. Smital 2020-08-26

On Functions and Functional Equations introduces the main topics in iteration theory and the theory of functional equations with emphasis on applications in the fields of mathematics, physics, biology, chemistry, and electronics and mechanical engineering. The book contains many classical results as well as important, more recent results. It also includes

numerous exercise and some problems that have yet to be resolved. The book is accessible to readers having a secondary level mathematical education.

Mathematical Analysis and Its Applications - S. M. Mazhar 2014-05-17
Mathematical Analysis and its Applications covers the proceedings of the International Conference on Mathematical Analysis and its Applications. The book presents studies that discuss several mathematical analysis methods and their respective applications. The text presents 38 papers that discuss topics, such as approximation of continuous functions by ultraspherical series and classes of bi-univalent functions. The representation of multipliers of eigen and joint function expansions of nonlocal spectral problems for first- and second-order differential operators is also discussed. The book will be of great interest to researchers and professionals whose work involves the use of mathematical analysis.

On Applications and Theory of Functional Equations - J. Aczél 2014-05-12
On Applications and Theory of Functional Equations focuses on the principles and advancement of numerical approaches used in functional equations. The publication first offers information on the history of functional equations, noting that the research on functional equations originated in problems related to applied mathematics. The text also highlights the influence of J. d'Alembert, S. D. Poisson, E. Picard, and A. L. Cauchy in promoting the processes of numerical analyses involving functional equations. The role of vectors in solving functional equations is also noted. The book ponders on the international Fifth Annual Meeting on Functional Equations, held in Waterloo, Ontario, Canada on April 24-30, 1967. The meeting gathered participants from America, Asia, Australia, and Europe. One of the topics presented at the meeting focuses on the survey of materials dealing with the progress of approaches in the processes and methodologies involved in solving problems dealing with functional equations. The influence, works, and contributions of A. L. Cauchy, G. Darboux, and G. S. Young to the field are also underscored. The publication is a valuable reference for readers interested in functional equations.

Functional Equations and Modelling in Science and Engineering - Enrique Castillo 1992-05-27

Provides engineers and applied scientists with some selected results of functional equations and their applications, with the intention of changing the way they think about mathematical modelling. Many of the proofs are simplified or omitted, so as not to bore or confuse engineers. Functional equati

Functional Equations in Applied Sciences - Enrique Castillo 2004-11-04
The book provides the reader with the different types of functional equations that s/he can find in practice, showing, step by step, how they can be solved. A general methodology for solving functional equations is provided in Chapter 2. The different types of functional equations are described and solved in Chapters 3 to 8. Many examples, coming from different fields, as geometry, science, engineering, economics, probability, statistics, etc, help the reader to change his/her mind in order to state problems as functional equations as an alternative to differential equations, and to state new problems in terms of functional equations or systems. An interesting feature of the book is that it deals with functional networks, a powerful generalization of neural networks that allows solving many practical problems. The second part of the book, Chapters 9 to 13, is devoted to the applications of this important paradigm. The book contains many examples and end of chapter exercises, that facilitates the understanding of the concepts and applications. · A general methodology for solving functional equations is provided in Chapter 2. · It deals with functional networks, a powerful generalization of neural networks. · Many examples, coming from different fields, as geometry, science, engineering, economics, probability, statistics, etc, illustrate the concept of functional equation. · Functional equations are presented as a powerful alternative to differential equations. · The book contains end of chapter exercises.

College Algebra - Jay Abramson 2018-01-07

College Algebra provides a comprehensive exploration of algebraic principles and meets scope and sequence requirements for a typical introductory algebra course. The modular approach and richness of

content ensure that the book meets the needs of a variety of courses. College Algebra offers a wealth of examples with detailed, conceptual explanations, building a strong foundation in the material before asking students to apply what they've learned. Coverage and Scope In determining the concepts, skills, and topics to cover, we engaged dozens of highly experienced instructors with a range of student audiences. The resulting scope and sequence proceeds logically while allowing for a significant amount of flexibility in instruction. Chapters 1 and 2 provide both a review and foundation for study of Functions that begins in Chapter 3. The authors recognize that while some institutions may find this material a prerequisite, other institutions have told us that they have a cohort that need the prerequisite skills built into the course. Chapter 1: Prerequisites Chapter 2: Equations and Inequalities Chapters 3-6: The Algebraic Functions Chapter 3: Functions Chapter 4: Linear Functions Chapter 5: Polynomial and Rational Functions Chapter 6: Exponential and Logarithm Functions Chapters 7-9: Further Study in College Algebra Chapter 7: Systems of Equations and Inequalities Chapter 8: Analytic Geometry Chapter 9: Sequences, Probability and Counting Theory *Famous Problems of Geometry and How to Solve Them* - Benjamin Bold 2012-05-11

Delve into the development of modern mathematics and match wits with Euclid, Newton, Descartes, and others. Each chapter explores an individual type of challenge, with commentary and practice problems. Solutions.

[Problem-Solving Strategies](#) - Arthur Engel 2008-01-19

A unique collection of competition problems from over twenty major national and international mathematical competitions for high school students. Written for trainers and participants of contests of all levels up to the highest level, this will appeal to high school teachers conducting a mathematics club who need a range of simple to complex problems and to those instructors wishing to pose a "problem of the week", thus bringing a creative atmosphere into the classrooms. Equally, this is a must-have for individuals interested in solving difficult and challenging problems. Each chapter starts with typical examples illustrating the

central concepts and is followed by a number of carefully selected problems and their solutions. Most of the solutions are complete, but some merely point to the road leading to the final solution. In addition to being a valuable resource of mathematical problems and solution strategies, this is the most complete training book on the market.

Mean Value Theorems and Functional Equations - Prasanna Sahoo 1998

This book takes a comprehensive look at mean value theorems and their connection with functional equations. Besides the traditional Lagrange and Cauchy mean value theorems, it covers the Pompeiu and the Flett mean value theorems as well as extension to higher dimensions and the complex plane. Furthermore the reader is introduced to the field of functional equations through equations that arise in connection with the many mean value theorems discussed.

Iterative Functional Equations - Marek Kuczma 1990-07-27

A cohesive and comprehensive account of the modern theory of iterative functional equations. Many of the results included have appeared before only in research literature, making this an essential volume for all those working in functional equations and in such areas as dynamical systems and chaos, to which the theory is closely related. The authors introduce the reader to the theory and then explore the most recent developments and general results. Fundamental notions such as the existence and uniqueness of solutions to the equations are stressed throughout, as are applications of the theory to such areas as branching processes, differential equations, ergodic theory, functional analysis and geometry. Other topics covered include systems of linear and nonlinear equations of finite and infinite ORD various function classes, conjugate and commutable functions, linearization, iterative roots of functions, and special functional equations.

On Functions and Functional Equations - J. Smital 2020-08-26

On Functions and Functional Equations introduces the main topics in iteration theory and the theory of functional equations with emphasis on applications in the fields of mathematics, physics, biology, chemistry, and electronics and mechanical engineering. The book contains many classical

results as well as important, more recent results. It also includes numerous exercise and some problems that have yet to be resolved. The book is accessible to readers having a secondary level mathematical education.

An Introduction to the Theory of Functional Equations and Inequalities - Marek Kuczma 2008-12-10

Marek Kuczma was born in 1935 in Katowice, Poland, and died there in 1991. After finishing high school in his home town, he studied at the Jagiellonian University in Kraków. He defended his doctoral dissertation under the supervision of Stanislaw Golab. In the year of his habilitation, in 1963, he obtained a position at the Katowice branch of the Jagiellonian University (now University of Silesia, Katowice), and worked there till his death. Besides his several administrative positions and his outstanding teaching activity, he accomplished excellent and rich scientific work publishing three monographs and 180 scientific papers. He is considered to be the founder of the celebrated Polish school of functional equations and inequalities. "The second half of the title of this book describes its contents adequately. Probably even the most devoted specialist would not have thought that about 300 pages can be written just about the Cauchy equation (and on some closely related equations and inequalities). And the book is by no means chatty, and does not even claim completeness. Part I lists the required preliminary knowledge in set and measure theory, topology and algebra. Part II gives details on solutions of the Cauchy equation and of the Jensen inequality [...], in particular on continuous convex functions, Hamel bases, on inequalities following from the Jensen inequality [...]. Part III deals with related equations and inequalities (in particular, Pexider, Hosszú, and conditional equations, derivations, convex functions of higher order, subadditive functions and stability theorems). It concludes with an excursion into the field of extensions of homomorphisms in general." (Janos Aczel, Mathematical Reviews) "This book is a real holiday for all the mathematicians independently of their strict speciality. One can imagine what deliciousness represents this book for functional equationists." (B. Crstici, Zentralblatt für Mathematik)

The Red Book of Mathematical Problems - Kenneth S. Williams

2012-06-29

Handy compilation of 100 practice problems, hints, and solutions indispensable for students preparing for the William Lowell Putnam and other mathematical competitions. Preface to the First Edition. Sources. 1988 edition.

The Statistical Theory of Shape - Christopher G. Small 2012-12-06

In general terms, the shape of an object, data set, or image can be defined as the total of all information that is invariant under translations, rotations, and isotropic rescalings. Thus two objects can be said to have the same shape if they are similar in the sense of Euclidean geometry. For example, all equilateral triangles have the same shape, and so do all cubes. In applications, bodies rarely have exactly the same shape within measurement error. In such cases the variation in shape can often be the subject of statistical analysis. The last decade has seen a considerable growth in interest in the statistical theory of shape. This has been the result of a synthesis of a number of different areas and a recognition that there is considerable common ground among these areas in their study of shape variation. Despite this synthesis of disciplines, there are several different schools of statistical shape analysis. One of these, the Kendall school of shape analysis, uses a variety of mathematical tools from differential geometry and probability, and is the subject of this book. The book does not assume a particularly strong background by the reader in these subjects, and so a brief introduction is provided to each of these topics. Anyone who is unfamiliar with this material is advised to consult a more complete reference. As the literature on these subjects is vast, the introductory sections can be used as a brief guide to the literature.

Functional Analysis, Sobolev Spaces and Partial Differential Equations - Haim Brezis 2010-11-02

This textbook is a completely revised, updated, and expanded English edition of the important *Analyse fonctionnelle* (1983). In addition, it contains a wealth of problems and exercises (with solutions) to guide the reader. Uniquely, this book presents in a coherent, concise and unified way the main results from functional analysis together with the main results from the theory of partial differential equations (PDEs). Although

there are many books on functional analysis and many on PDEs, this is the first to cover both of these closely connected topics. Since the French book was first published, it has been translated into Spanish, Italian, Japanese, Korean, Romanian, Greek and Chinese. The English edition makes a welcome addition to this list.

Short Course on Functional Equations - J. Aczél 1987

Review(s)'... this book is not only an impressive example how mathematics can be applied to problems arising in the social and behavioral sciences, but also on outstanding course on functional equations. This course is short, as the title says, but leads astonishingly far, since the material is presented very economically. I am convinced that every reader will enjoy this book greatly.' *Zeitschrift für Operations Research*, June 1989.

Functional Equations and Inequalities - Themistocles RASSIAS 2012-12-06

This volume provides an extensive study of some of the most important topics of current interest in functional equations and inequalities. Subjects dealt with include: a Pythagorean functional equation, a functional definition of trigonometric functions, the functional equation of the square root spiral, a conditional Cauchy functional equation, an iterative functional equation, the Hille-type functional equation, the polynomial-like iterative functional equation, distribution of zeros and inequalities for zeros of algebraic polynomials, a qualitative study of Lobachevsky's complex functional equation, functional inequalities in special classes of functions, replicativity and function spaces, normal distributions, some difference equations, finite sums, decompositions of functions, harmonic functions, set-valued quasiconvex functions, the problems of expressibility in some extensions of free groups, Aleksandrov problem and mappings which preserve distances, Ulam's problem, stability of some functional equation for generalized trigonometric functions, Hyers-Ulam stability of Hosszú's equation, superstability of a functional equation, and some demand functions in a duopoly market with advertising. Audience: This book will be of interest to mathematicians and graduate students whose work involves real functions, functions of a complex variable,

functional analysis, integral transforms, and operational calculus. *Introduction to Functional Equations* - Costas Efthimiou 2011-10-13
Functions and their properties have been part of the rigorous precollege curriculum for decades. And functional equations have been a favorite topic of the leading national and international mathematical competitions. Yet the subject has not received equal attention by authors at an introductory level. The majority of the books on the topic remain unreachable to the curious and intelligent precollege student. The present book is an attempt to eliminate this disparity. The book opens with a review chapter on functions, which collects the relevant foundational information on functions, plus some material potentially new to the reader. The next chapter presents a working definition of functional equations and explains the difficulties in trying to systematize the theory. With each new chapter, the author presents methods for the solution of a particular group of equations. Each chapter is complemented with many solved examples, the majority of which are taken from mathematical competitions and professional journals. The book ends with a chapter of unsolved problems and some other auxiliary material. The book is an invaluable resource for precollege and college students who want to deepen their knowledge of functions and their properties, for teachers and instructors who wish to enrich their curricula, and for any lover of mathematical problem-solving techniques. In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession.

International Symposium on Nonlinear Differential Equations and Nonlinear Mechanics - Joseph Lasalle 2012-12-02

Nonlinear Differential Equations and Nonlinear Mechanics provides information pertinent to nonlinear differential equations, nonlinear mechanics, control theory, and other related topics. This book discusses the properties of solutions of equations in standard form in the infinite time interval. Organized into 49 chapters, this book starts with an overview of the characteristic types of differential equation systems with

small parameters. This text then explains the structurally stable fields on a differentiable two manifold are the ones that exhibit the simplest features. Other chapters explore the canonic system of hyperbolic partial differential equations with fixed characteristics. This book discusses as well the monofrequent oscillations that are predominantly near one or the other of the linear modes of motion. The final chapter deals with the existence and asymptotic character of solutions of the nonlinear boundary value problem. This book is a valuable resource for pure and applied mathematicians. Aircraft engineers will also find this book useful.

Functional Equations and Inequalities with Applications - Palaniappan Kannappan 2009-06-10

Functional Equations and Inequalities with Applications presents a comprehensive, nearly encyclopedic, study of the classical topic of functional equations. This self-contained monograph explores all aspects of functional equations and their applications to related topics, such as differential equations, integral equations, the Laplace transformation, the calculus of finite differences, and many other basic tools in analysis. Each chapter examines a particular family of equations and gives an in-depth study of its applications as well as examples and exercises to support the material.

Topics in Contemporary Mathematical Analysis and Applications - Hemen Dutta 2020-12-22

Topics in Contemporary Mathematical Analysis and Applications encompasses several contemporary topics in the field of mathematical analysis, their applications, and relevancies in other areas of research and study. The readers will find developments concerning the topics presented to a reasonable extent with various new problems for further study. Each chapter carefully presents the related problems and issues, methods of solutions, and their possible applications or relevancies in other scientific areas. Aims at enriching the understanding of methods, problems, and applications Offers an understanding of research problems by presenting the necessary developments in reasonable details Discusses applications and uses of operator theory, fixed-point theory, inequalities, bi-univalent functions, functional equations, and scalar-

objective programming, and presents various associated problems and ways to solve such problems This book is written for individual researchers, educators, students, and department libraries.

Berkeley Problems in Mathematics - Paulo Ney de Souza 2004-01-08

This book collects approximately nine hundred problems that have appeared on the preliminary exams in Berkeley over the last twenty years. It is an invaluable source of problems and solutions. Readers who work through this book will develop problem solving skills in such areas as real analysis, multivariable calculus, differential equations, metric spaces, complex analysis, algebra, and linear algebra.

Classical and Quantum Orthogonal Polynomials in One Variable - Mourad Ismail 2005-11-21

The first modern treatment of orthogonal polynomials from the viewpoint of special functions is now available in paperback.

The Cauchy-Schwarz Master Class - J. Michael Steele 2004-04-26

This lively, problem-oriented text, first published in 2004, is designed to coach readers toward mastery of the most fundamental mathematical inequalities. With the Cauchy-Schwarz inequality as the initial guide, the reader is led through a sequence of fascinating problems whose solutions are presented as they might have been discovered - either by one of history's famous mathematicians or by the reader. The problems emphasize beauty and surprise, but along the way readers will find systematic coverage of the geometry of squares, convexity, the ladder of power means, majorization, Schur convexity, exponential sums, and the inequalities of Hölder, Hilbert, and Hardy. The text is accessible to anyone who knows calculus and who cares about solving problems. It is well suited to self-study, directed study, or as a supplement to courses in analysis, probability, and combinatorics.

Mathematics for Machine Learning - Marc Peter Deisenroth 2020-04-23

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science

or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

Handbook of Functional Equations - Themistocles M. Rassias
2014-11-18

As Richard Bellman has so elegantly stated at the Second International Conference on General Inequalities (Oberwolfach, 1978), "There are three reasons for the study of inequalities: practical, theoretical, and aesthetic." On the aesthetic aspects, he said, "As has been pointed out, beauty is in the eye of the beholder. However, it is generally agreed that certain pieces of music, art, or mathematics are beautiful. There is an elegance to inequalities that makes them very attractive." The content of the Handbook focuses mainly on both old and recent developments on approximate homomorphisms, on a relation between the Hardy–Hilbert and the Gabriel inequality, generalized Hardy–Hilbert type inequalities on multiple weighted Orlicz spaces, half-discrete Hilbert-type inequalities, on affine mappings, on contractive operators, on multiplicative Ostrowski and trapezoid inequalities, Ostrowski type inequalities for the Riemann–Stieltjes integral, means and related functional inequalities, Weighted Gini means, controlled additive relations, Szasz–Mirakyan operators, extremal problems in polynomials and entire functions, applications of functional equations to Dirichlet problem for doubly connected domains, nonlinear elliptic problems depending on parameters, on strongly convex functions, as well as applications to some new algorithms for solving general equilibrium problems, inequalities for the

Fisher's information measures, financial networks, mathematical models of mechanical fields in media with inclusions and holes.

Partial Differential Equations - Walter A. Strauss 2007-12-21
Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

Inverse Problem Theory and Methods for Model Parameter Estimation -
Albert Tarantola 2005-01-01

While the prediction of observations is a forward problem, the use of actual observations to infer the properties of a model is an inverse problem. Inverse problems are difficult because they may not have a unique solution. The description of uncertainties plays a central role in the theory, which is based on probability theory. This book proposes a general approach that is valid for linear as well as for nonlinear problems. The philosophy is essentially probabilistic and allows the reader to understand the basic difficulties appearing in the resolution of inverse problems. The book attempts to explain how a method of acquisition of information can be applied to actual real-world problems, and many of the arguments are heuristic.

Functional Equations in Mathematical Olympiads (2017 - 2018) -

Amir Hossein Parvardi 2018-05-29

Functional equations, which are a branch of algebraic problems used in mathematical competitions, appear in recent olympiads very frequently. The current book is the first volume in a series of books on collections of solved problems in functional equations. This volume contains 175 problems on the subject, including those used in latest mathematical olympiads (2017 - 2018) around the world. The basic concepts of functional equations and techniques of problem solving have been briefly discussed in the preamble of the book.

Functional Equations in Mathematical Analysis - Themistocles M. Rassias 2011-09-18

The stability problem for approximate homomorphisms, or the Ulam stability problem, was posed by S. M. Ulam in the year 1941. The solution of this problem for various classes of equations is an expanding area of research. In particular, the pursuit of solutions to the Hyers-Ulam and Hyers-Ulam-Rassias stability problems for sets of functional equations and inequalities has led to an outpouring of recent research. This volume, dedicated to S. M. Ulam, presents the most recent results on the solution to Ulam stability problems for various classes of functional equations and inequalities. Comprised of invited contributions from notable researchers and experts, this volume presents several important types of functional equations and inequalities and their applications to problems in mathematical analysis, geometry, physics and applied mathematics. "Functional Equations in Mathematical Analysis" is intended for researchers and students in mathematics, physics, and other computational and applied sciences.

PETSc for Partial Differential Equations: Numerical Solutions in C and Python - Ed Bueler 2020-10-22

The Portable, Extensible Toolkit for Scientific Computation (PETSc) is an open-source library of advanced data structures and methods for solving

linear and nonlinear equations and for managing discretizations. This book uses these modern numerical tools to demonstrate how to solve nonlinear partial differential equations (PDEs) in parallel. It starts from key mathematical concepts, such as Krylov space methods, preconditioning, multigrid, and Newton's method. In PETSc these components are composed at run time into fast solvers. Discretizations are introduced from the beginning, with an emphasis on finite difference and finite element methodologies. The example C programs of the first 12 chapters, listed on the inside front cover, solve (mostly) elliptic and parabolic PDE problems. Discretization leads to large, sparse, and generally nonlinear systems of algebraic equations. For such problems, mathematical solver concepts are explained and illustrated through the examples, with sufficient context to speed further development. PETSc for Partial Differential Equations addresses both discretizations and fast solvers for PDEs, emphasizing practice more than theory. Well-structured examples lead to run-time choices that result in high solver performance and parallel scalability. The last two chapters build on the reader's understanding of fast solver concepts when applying the Firedrake Python finite element solver library. This textbook, the first to cover PETSc programming for nonlinear PDEs, provides an on-ramp for graduate students and researchers to a major area of high-performance computing for science and engineering. It is suitable as a supplement for courses in scientific computing or numerical methods for differential equations.

Functional Identities - Matej Brešar 2007-08-08

A functional identity can be informally described as an identical relation involving arbitrary elements in an associative ring together with arbitrary (unknown) functions. The theory of functional identities is a relatively new one, and this is the first book on this subject. The book is accessible to a wide audience and touches on a variety of mathematical areas such as ring theory, algebra and operator theory.