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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.
Scientific and Technical Aerospace Reports - 1980
Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.
Boundary Value Problems of Mathematical Physics - Ivar Stakgold 2000-06-30
For more than 30 years, this two-volume set has helped prepare graduate students to use partial differential equations and integral equations to handle significant problems arising in applied mathematics, engineering, and the physical sciences. Originally published in 1967, this graduate-level introduction is devoted to the mathematics needed for the modern approach to boundary value problems using Green's functions and using eigenvalue expansions. Now a part of SIAM's Classics series, these volumes contain a large number of concrete, interesting examples of boundary value problems for partial differential equations that cover a variety of applications that are still relevant today. For example, there is substantial treatment of the Helmholtz equation and scattering theory?subjects that play a central role in contemporary inverse problems in acoustics and electromagnetic theory.
Applied Engineering Analysis - Tai-Ran Hsu 2018-04-30
A resource book applying mathematics to solve engineering problems Applied Engineering Analysis is a concise textbookwhich demonstrates how toapply mathematics to solve engineering problems. It begins with an overview of engineering analysis and an introduction to mathematical modeling, followed by vector calculus, matrices and linear algebra, and applications of first and second order differential

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equations. Fourier series and Laplace transform are also covered, along with partial differential equations, numerical solutions to nonlinear and differential equations and an introduction to finite element analysis. The book also covers statistics with applications to design and statistical process controls. Drawing on the author's extensive industry and teaching experience, spanning 40 years, the book takes a pedagogical approach and includes examples, case studies and end of chapter problems. It is also accompanied by a website hosting a solutions manual and PowerPoint slides for instructors. Key features: Strong emphasis on deriving equations, not just solving given equations, for the solution of engineering problems. Examples and problems of a practical nature with illustrations to enhance student's self-learning. Numerical methods and techniques, including finite element analysis. Includes coverage of statistical methods for probabilistic design analysis of structures and statistical process control (SPC). Applied Engineering Analysis is a resource book for engineering students and professionals to learn how to apply the mathematics experience and skills that they have already acquired to their engineering profession for innovation, problem solving, and decision making.

Elementary Differential Equations and Boundary Value Problems - William E. Boyce 2017-08-21

Elementary Differential Equations and Boundary Value Problems 11e, like its predecessors, is written from the viewpoint of the applied mathematician, whose interest in differential equations may sometimes be quite theoretical, sometimes intensely practical, and often somewhere in between. The authors have sought to combine a sound and accurate (but not abstract) exposition of the elementary theory of differential equations with considerable material on methods of solution, analysis, and approximation that have proved useful in a wide variety of applications. While the general structure of the book remains unchanged, some notable changes have been made to improve the clarity and readability of basic material about differential equations and their applications. In addition to expanded explanations, the 11th edition includes new problems, updated figures and examples to help motivate students. The program is primarily intended for undergraduate students of mathematics, science, or engineering, who typically take a course on differential equations during their first or second year of study. The main prerequisite for engaging with the program is a working knowledge of calculus, gained from a normal two or three semester course sequence or its equivalent. Some familiarity with matrices will also be helpful in the chapters on systems of differential equations.

Nuclear Science Abstracts - 1971

Introduction to Integral Equations with Applications - A. Jerri 1999-09-03

From the reviews of the First Edition: "Extremely clear, self-contained text . . . offers to a wide class of readers the theoretical foundations and the modern numerical methods of the theory of linear integral equations."-Revue Roumaine de Mathematiques Pures et Appliquées. Abdul Jerri has revised his highly applied book to make it even more useful for scientists and engineers, as well as mathematicians. Covering the fundamental ideas and techniques at a level accessible to anyone with a solid undergraduate background in calculus and differential equations, Dr. Jerri clearly demonstrates how to use integral equations to solve real-world engineering and physics problems. This edition provides precise guidelines to the basic methods of solutions, details more varied numerical methods, and substantially boosts the total of practical examples and exercises. Plus, it features added emphasis on the basic theorems for the existence and uniqueness of solutions of integral equations and points out the interrelation between differentiation and integration. Other features include: * A new section on integral equations in higher dimensions. * An improved presentation of the Laplace and Fourier transforms. * A new detailed section for Fredholm integral equations of the first kind. * A new chapter covering the basic higher quadrature numerical integration rules. * A concise introduction to linear and nonlinear integral equations. * Clear examples of singular integral equations and their solutions. * A student's solutions manual available directly from the author.

Partial Differential Equations and Boundary-Value Problems with Applications - Mark A.

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Pinsky 2011
Building on the basic techniques of separation of variables and Fourier series, the book presents the solution of boundary-value problems for basic partial differential equations: the heat equation, wave equation, and Laplace equation, considered in various standard coordinate systems--rectangular, cylindrical, and spherical. Each of the equations is derived in the three-dimensional context; the solutions are organized according to the geometry of the coordinate system, which makes the mathematics especially transparent. Bessel and Legendre functions are studied and used whenever appropriate throughout the text. The notions of steady-state solution of closely related stationary solutions are developed for the heat equation; applications to the study of heat flow in the earth are presented. The problem of the vibrating string is studied in detail both in the Fourier transform setting and from the viewpoint of the explicit representation (d'Alembert formula). Additional chapters include the numerical analysis of solutions and the method of Green's functions for solutions of partial differential equations. The exposition also includes asymptotic methods (Laplace transform and stationary phase). With more than 200 working examples and 700 exercises (more than 450 with answers), the book is suitable for an undergraduate course in partial differential equations.

Unified Transform for Boundary Value Problems - Athanasios S. Fokas 2014-12-30
This book describes state-of-the-art advances and applications of the unified transform and its relation to the boundary element method. The authors present the solution of boundary value problems from several different perspectives, in particular the type of problems modeled by partial differential equations (PDEs). They discuss recent applications of the unified transform to the analysis and numerical modeling of boundary value problems for linear and integrable nonlinear PDEs and the closely related boundary element method, a well-established numerical approach for solving linear elliptic PDEs.? The text is divided into three parts. Part I contains new theoretical results on linear and nonlinear evolutionary and elliptic problems. New explicit solution representations for several classes of boundary value problems are constructed and rigorously analyzed. Part II is a detailed overview of variational formulations for elliptic problems. It places the unified transform approach in a classic context alongside the boundary element method and stresses its novelty. Part III presents recent numerical applications based on the boundary element method and on the unified transform.

Essentials of Partial Differential Equations - Marin Marin 2018-05-09
This book offers engineering students an introduction to the theory of partial differential equations and then guiding them through the modern problems in this subject. Divided into two parts, in the first part readers already well-acquainted with problems from the theory of differential and integral equations gain insights into the classical notions and problems, including differential operators, characteristic surfaces, Levi functions, Green’s function, and Green’s formulas. Readers are also instructed in the extended potential theory in its three forms: the volume potential, the surface single-layer potential and the surface double-layer potential. Furthermore, the book presents the main initial boundary value problems associated with elliptic, parabolic and hyperbolic equations. The second part of the book, which is addressed first and foremost to those who are already acquainted with the notions and the results from the first part, introduces readers to modern aspects of the theory of partial differential equations.

Theory and Application of Multiple Laplace Transforms to the Solution of Problems in Electric Circuit Analysis and Electromagnetic Theory - Thelma Austern Estrin 1949

Laplace Transform Inversion by Fourier Series Expansion - Eugene L. Marvin 1973
A computerized algorithm that may be used for performing the Laplace and double Laplace-Handel inverse integral transformations is presented. The theoretical basis of the algorithm is given, and the results of numerical tests performed on the transformed images of known solution functions are shown. The general application of the algorithm to real problems is discussed, and experience gained in applying it is presented. The application of the algorithm in the solution of initial-boundary value problems is treated specifically. (Author).

Introductory Differential Equations - Martha L. L.

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Abell 2009-09-09
This text is for courses that are typically called (Introductory) Differential Equations, (Introductory) Partial Differential Equations, Applied Mathematics, Fourier Series and Boundary Value Problems. The text is appropriate for two semester courses: the first typically emphasizes ordinary differential equations and their applications while the second emphasizes special techniques (like Laplace transforms) and partial differential equations. The texts follows a "traditional" curriculum and takes the "traditional" (rather than "dynamical systems") approach. Introductory Differential Equations is a text that follows a traditional approach and is appropriate for a first course in ordinary differential equations (including Laplace transforms) and a second course in Fourier series and boundary value problems. Note that some schools might prefer to move the Laplace transform material to the second course, which is why we have placed the chapter on Laplace transforms in its location in the text. Ancillaries like Differential Equations with Mathematica and/or Differential Equations with Maple would be recommended and/or required ancillaries depending on the school, course, or instructor. *Technology Icons These icons highlight text that is intended to alert students that technology may be used intelligently to solve a problem, encouraging logical thinking and application * Think About It Icons and Examples Examples that end in a question encourage students to think critically about what to do next, whether it is to use technology or focus on a graph to determine an outcome *Differential Equations at Work These are projects requiring students to think critically by having students answer questions based on different conditions, thus engaging students

Partial Differential Equations - Harumi Hattori 2013-01-28
This volume is an introductory level textbook for partial differential equations (PDE's) and suitable for a one-semester undergraduate level or two-semester graduate level course in PDE's or applied mathematics. Chapters One to Five are organized according to the equations and the basic PDE's are introduced in an easy to understand manner. They include the first-order equations and the three fundamental second-order equations, i.e. the heat, wave and Laplace equations. Through these equations we learn the types of problems, how we pose the problems, and the methods of solutions such as the separation of variables and the method of characteristics. The modeling aspects are explained as well. The methods introduced in earlier chapters are developed further in Chapters Six to Twelve. They include the Fourier series, the Fourier and the Laplace transforms, and the Green's functions. The equations in higher dimensions are also discussed in detail. This volume is application-oriented and rich in examples. Going through these examples, the reader is able to easily grasp the basics of PDE's.
Introduction To Partial Differential Equations (With Maple), An: A Concise Course - Zhilin Li 2021-09-23
The book is designed for undergraduate or beginning level graduate students, and students from interdisciplinary areas including engineers, and others who need to use partial differential equations, Fourier series, Fourier and Laplace transforms. The prerequisite is a basic knowledge of calculus, linear algebra, and ordinary differential equations.The textbook aims to be practical, elementary, and reasonably rigorous; the book is concise in that it describes fundamental solution techniques for first order, second order, linear partial differential equations for general solutions, fundamental solutions, solution to Cauchy (initial value) problems, and boundary value problems for different PDEs in one and two dimensions, and different coordinates systems. Analytic solutions to boundary value problems are based on Sturm-Liouville eigenvalue problems and series solutions.The book is accompanied with enough well tested Maple files and some Matlab codes that are available online. The use of Maple makes the complicated series solution simple, interactive, and visible. These features distinguish the book from other textbooks available in the related area.

Solution of Boundary-value Problems in Arbitrary Sectors by Use of the Double Laplace Transform - John Murray Perry 1960

U.S. Government Research & Development Reports - 1970

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Partial Differential Equations in Mechanics 1 - A.P.S. Selvadurai 2000-10-19
This two-volume work focuses on partial differential equations (PDEs) with important applications in mechanical and civil engineering, emphasizing mathematical correctness, analysis, and verification of solutions. The presentation involves a discussion of relevant PDE applications, its derivation, and the formulation of consistent boundary conditions.
Partial Differential Equations: Methods, Applications And Theories (2nd Edition) - Harumi Hattori 2019-06-24
This is an introductory level textbook for partial differential equations (PDEs). It is suitable for a one-semester undergraduate level or two-semester graduate level course in PDEs or applied mathematics. This volume is application-oriented and rich in examples. Going through these examples, the reader is able to easily grasp the basics of PDEs.Chapters One to Five are organized to aid understanding of the basic PDEs. They include the first-order equations and the three fundamental second-order equations, i.e. the heat, wave and Laplace equations. Through these equations, we learn the types of problems, how we pose the problems, and the methods of solutions such as the separation of variables and the method of characteristics. The modeling aspects are explained as well. The methods introduced in earlier chapters are developed further in Chapters Six to Twelve. They include the Fourier series, the Fourier and the Laplace transforms, and the Green's functions. Equations in higher dimensions are also discussed in detail. In this second edition, a new chapter is added and numerous improvements have been made including the reorganization of some chapters. Extensions of nonlinear equations treated in earlier chapters are also discussed.Partial differential equations are becoming a core subject in Engineering and the Sciences. This textbook will greatly benefit those studying in these subjects by covering basic and advanced topics in PDEs based on applications.
Analytic functions Integral transforms Differential Equations - F. Gazzola 2020-07-01
Differential equations play a relevant role in many disciplines and provide powerful tools for analysis and modeling in applied sciences. The book contains several classical and modern methods for the study of ordinary and partial differential equations. A broad space is reserved to Fourier and Laplace transforms together with their applications to the solution of boundary value and/or initial value problems for differential equations. Basic prerequisites concerning analytic functions of complex variable and Lp spaces are synthetically presented in the first two chapters. Techniques based on integral transforms and Fourier series are presented in specific chapters, first in the easier framework of integrable functions and later in the general framework of distributions. The less elementary distributional context allows to deal also with differential equations with highly irregular data and pulse signals. The theory is introduced concisely, while learning of miscellaneous methods is achieved step-by-step through the proposal of many exercises of increasing difficulty. Additional recap exercises are collected in dedicated sections. Several tables for easy reference of main formulas are available at the end of the book. The presentation is oriented mainly to students of Schools in Engineering, Sciences and Economy. The partition of various topics in several self-contained and independent sections allows an easy splitting in at least two didactic modules: one at undergraduate level, the other at graduate level.
The Laplace Transform - Joel L. Schiff 2014-01-15

Wave Propagation in Drilling, Well Logging and Reservoir Applications - Wilson C. Chin 2014-09-19
Wave propagation is central to all areas of petroleum engineering, e.g., drilling vibrations, MWD mud pulse telemetry, swab-surge, geophysical ray tracing, ocean and current interactions, electromagnetic wave and sonic applications in the borehole, but rarely treated rigorously or described in truly scientific terms, even for a single discipline. Wilson Chin, an MIT and Caltech educated scientist who has consulted internationally, provides an integrated, comprehensive, yet readable exposition covering all of the cited topics, offering insights, algorithms and validated methods never before published. A must on every petroleum engineering bookshelf! In particular, the book: Delivers drillstring vibrations models coupling

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axial, torsional and lateral motions that predict rate-of-penetration, bit bounce and stick-slip as they depend on rock-bit interaction and bottomhole assembly properties, Explains why catastrophic lateral vibrations at the neutral point cannot be observed from the surface even in vertical wells, but providing a proven method to avoid them, Demonstrates why Fermat's "principle of least time" (used in geophysics) applies to non-dissipative media only, but using the "kinematic wave theory" developed at MIT, derives powerful methods applicable to general attenuative inhomogeneous media, Develops new approaches to mud acoustics and applying them to MWD telemetry modeling and strong transients in modern swab-surge applicagtions, Derives new algorithms for borehole geophysics interpretation, e.g., Rh and Rv in electromagnetic wave and permeability in Stoneley waveform analysis, and Outlines many more applications, e.g., wave loadings on offshore platforms, classical problems in wave propagation, and extensions to modern kinematic wave theory. These disciplines, important to all field-oriented activities, are not treated as finite element applications that are simply gridded, "number-crunched" and displayed, but as scientific disciplines deserving of clear explanation. General results are carefully motivated, derived and applied to real-world problems, with results demonstrating the importance and predictive capabilities of the new methods.

Integral and Discrete Transforms with Applications and Error Analysis - Abdul Jerri 2021-11-19

This reference/text desribes the basic elements of the integral, finite, and discrete transforms - emphasizing their use for solving boundary and initial value problems as well as facilitating the representations of signals and systems.;Proceeding to the final solution in the same setting of Fourier analysis without interruption, Integral and Discrete Transforms with Applications and Error Analysis: presents the background of the FFT and explains how to choose the appropriate transform for solving a boundary value problem; discusses modelling of the basic partial differential equations, as well as the solutions in terms of the main special functions; considers the Laplace, Fourier, and Hankel transforms and their variations, offering a more logical continuation of the operational method; covers integral, discrete, and finite transforms and trigonometric Fourier and general orthogonal series expansion, providing an application to signal analysis and boundary-value problems; and examines the practical approximation of computing the resulting Fourier series or integral representation of the final solution and treats the errors incurred.;Containing many detailed examples and numerous end-of-chapter exercises of varying difficulty for each section with answers, Integral and Discrete Transforms with Applications and Error Analysis is a thorough reference for analysts; industrial and applied mathematicians; electrical, electronics, and other engineers; and physicists and an informative text for upper-level undergraduate and graduate students in these disciplines.

Fourier Analysis and Boundary Value Problems - Enrique A. Gonzalez-Velasco 1996-11-28

Fourier Analysis and Boundary Value Problems provides a thorough examination of both the theory and applications of partial differential equations and the Fourier and Laplace methods for their solutions. Boundary value problems, including the heat and wave equations, are integrated throughout the book. Written from a historical perspective with extensive biographical coverage of pioneers in the field, the book emphasizes the important role played by partial differential equations in engineering and physics. In addition, the author demonstrates how efforts to deal with these problems have lead to wonderfully significant developments in mathematics. A clear and complete text with more than 500 exercises, Fourier Analysis and Boundary Value Problems is a good introduction and a valuable resource for those in the field. Topics are covered from a historical perspective with biographical information on key contributors to the field The text contains more than 500 exercises Includes practical applications of the equations to problems in both engineering and physics

Transform Methods for Solving Partial Differential Equations - Dean G. Duffy 2004-07-15

Transform methods provide a bridge between the commonly used method of separation of variables and numerical techniques for solving

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linear partial differential equations. While in some ways similar to separation of variables, transform methods can be effective for a wider class of problems. Even when the inverse of the transform cannot be found ana

Integral Transforms and Their Applications, Third Edition - Lokenath Debnath 2014-11-07

Integral Transforms and Their Applications, Third Edition covers advanced mathematical methods for many applications in science and engineering. The book is suitable as a textbook for senior undergraduate and first-year graduate students and as a reference for professionals in mathematics, engineering, and applied sciences. It presents a systematic development of the underlying theory as well as a modern approach to Fourier, Laplace, Hankel, Mellin, Radon, Gabor, wavelet, and Z transforms and their applications. New to the Third Edition New material on the historical development of classical and modern integral transforms New sections on Fourier transforms of generalized functions, the Poisson summation formula, the Gibbs phenomenon, and the Heisenberg uncertainty principle Revised material on Laplace transforms and double Laplace transforms and their applications New examples of applications in mechanical vibrations, electrical networks, quantum mechanics, integral and functional equations, fluid mechanics, mathematical statistics, special functions, and more New figures that facilitate a clear understanding of physical explanations Updated exercises with solutions, tables of integral transforms, and bibliography Through numerous examples and end-of-chapter exercises, this book develops readers' analytical and computational skills in the theory and applications of transform methods. It provides accessible working knowledge of the analytical methods and proofs required in pure and applied mathematics, physics, and engineering, preparing readers for subsequent advanced courses and research in these areas.

Integral Methods in Science and Engineering, Volume 1 - Christian Constanda 2017-09-08

This contributed volume contains a collection of articles on the most recent advances in integral methods. The first of two volumes, this work focuses on the construction of theoretical integral methods. Written by internationally recognized researchers, the chapters in this book are based on talks given at the Fourteenth International Conference on Integral Methods in Science and Engineering, held July 25-29, 2016, in Padova, Italy. A broad range of topics is addressed, such as:• Integral equations• Homogenization• Duality methods• Optimal design• Conformal techniques This collection will be of interest to researchers in applied mathematics, physics, and mechanical and electrical engineering, as well as graduate students in these disciplines, and to other professionals who use integration as an essential tool in their work.

The Laplace Transform - Richard Bellman 1984

The classical theory of the Laplace Transform can open many new avenues when viewed from a modern, semi-classical point of view. In this book, the author re-examines the Laplace Transform and presents a study of many of the applications to differential equations, differential-difference equations and the renewal equation.

Differential Equations - Robert P. Gilbert 2021-06-29

This book illustrates how MAPLE can be used to supplement a standard, elementary text in ordinary and partial differential equation. MAPLE is used with several purposes in mind. The authors are firm believers in the teaching of mathematics as an experimental science where the student does numerous calculations and then synthesizes these experiments into a general theory. Projects based on the concept of writing generic programs test a student's understanding of the theoretical material of the course. A student who can solve a general problem certainly can solve a specialized problem. The authors show MAPLE has a built-in program for doing these problems. While it is important for the student to learn MAPLEŚ in built programs, using these alone removes the student from the conceptual nature of differential equations. The goal of the book is to teach the students enough about the computer algebra system MAPLE so that it can be used in an investigative way. The investigative materials which are present in the book are done in desk calculator mode DCM, that is the calculations are in the order command line followed by output line. Frequently, this approach eventually leads to a program or procedure in MAPLE designated by proc and completed by end proc. This book was developed through ten years

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of instruction in the differential equations course. Table of Contents 1. Introduction to the Maple DEtools 2. First-order Differential Equations 3. Numerical Methods for First Order Equations 4. The Theory of Second Order Differential Equations with Con- 5. Applications of Second Order Linear Equations 6. Two-Point Boundary Value Problems, Catalytic Reactors and 7. Eigenvalue Problems 8. Power Series Methods for Solving Differential Equations 9. Nonlinear Autonomous Systems 10. Integral Transforms Biographies Robert P. Gilbert holds a Ph.D. in mathematics from Carnegie Mellon University. He and Jerry Hile originated the method of generalized hyperanalytic function theory. Dr. Gilbert was professor at Indiana University, Bloomington and later became the Unidel Foundation Chair of Mathematics at the University of Delaware. He has published over 300 articles in professional journals and conference proceedings. He is the Founding Editor of two mathematics journals Complex Variables and Applicable Analysis. He is a three-time Awardee of the Humboldt-Preis, and. received a British Research Council award to do research at Oxford University. He is also the recipient of a Doctor Honoris Causa from the I. Vekua Institute of Applied Mathematics at Tbilisi State University. George C. Hsiao holds a doctorate degree in Mathematics from Carnegie Mellon University. Dr. Hsiao is the Carl J. Rees Professor of Mathematics Emeritus at the University of Delaware from which he retired after 43 years on the faculty of the Department of Mathematical Sciences. Dr. Hsiao was also the recipient of the Francis Alison Faculty Award, the University of Delaware's most prestigious faculty honor, which was bestowed on him in recognition of his scholarship, professional achievement and dedication. His primary research interests are integral equations and partial differential equations with their applications in mathematical physics and continuum mechanics. He is the author or co-author of more than 200 publications in books and journals. Dr. Hsiao is world-renowned for his expertise in Boundary Element Method and has given invited lectures all over the world. Robert J. Ronkese holds a PhD in applied mathematics from the University of Delaware. He is a professor of mathematics at the US Merchant Marine Academy on Long Island. As an undergraduate, he was an exchange student at the Swiss Federal Institute of Technology (ETH) in Zurich. He has held visiting positions at the US Military Academy at West Point and at the University of Central Florida in Orlando.

Introduction to the Theory and Application of the Laplace Transformation - G. Doetsch 2012-12-06

In anglo-american literature there exist numerous books, devoted to the application of the Laplace transformation in technical domains such as electrotechnics, mechanics etc. Chiefly, they treat problems which, in mathematical language, are governed by ordi nary and partial differential equations, in various physically dressed forms. The theoretical foundations of the Laplace transformation are presented usually only in a simplified manner, presuming special properties with respect to the transformed func tions, which allow easy proofs. By contrast, the present book intends principally to develop those parts of the theory of the Laplace transformation, which are needed by mathematicians, physicists a,nd engineers in their daily routine work, but in complete generality and with detailed, exact proofs. The applications to other mathematical domains and to technical prob lems are inserted, when the theory is adequately· developed to present the tools necessary for their treatment. Since the book proceeds, not in a rigorously systematic manner, but rather from easier to more difficult topics, it is suited to be read from the beginning as a textbook, when one wishes to familiarize oneself for the first time with the Laplace transforma tion. For those who are interested only in particular details, all results are specified in "Theorems" with explicitly formulated assumptions and assertions. Chapters 1-14 treat the question of convergence and the mapping properties of the Laplace transformation. The interpretation of the transformation as the mapping of one function space to another (original and image functions) constitutes the dom inating idea of all subsequent considerations.

Operational Calculus in Two Variables and Its Applications - V.A. Ditkin 2017-09-13

Concise treatment of fundamental theory explores two-dimensional Laplace transform and basic definitions, theorems, applications of

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operational calculus in two variables. Includes tables of formulae for various categories of functions. 1962 edition.

Engineering Applications of the Laplace Transform - Y.H. Gangadharaiah 2021-08-25

This book is devoted to one of the most critical areas of applied mathematics, namely the Laplace transform technique for linear time invariance systems arising from the fields of electrical and mechanical engineering. It focuses on introducing Laplace transformation and its operating properties, finding inverse Laplace transformation through different methods, and describing transfer function applications for mechanical and electrical networks to develop input and output relationships. It also discusses solutions of initial value problems, the state-variables approach, and the solution of boundary value problems connected with partial differential equations.

Modern Differential Equations - Martha L. Abell 2001

1. Introduction to Differential Equations. Introduction. A Graphical Approach to Solutions: Slope Fields and Direction Fields. Summary. Review Exercises. 2. First Order Equations. Separable Equations. First-Order Linear Equations. Substitution Methods and Special Equations. Exact Equations. Theory of First-Order-Equations. Numerical Methods for First-Order Equations. Summary. Review Exercises. Differential Equations at Work. Modeling the Spread of a Disease. Linear Population Model with Harvesting. Logistic Model with Harvesting. Logistic Model with Predation. 3. Applications of First Order Equations. Population Growth and Decay. Newton's Law of Cooling and Related Problems. Free-Falling Bodies. Summary. Review Exercises. Chapter 3 Differential Equations at Work. Mathematics of Finance. Algae Growth. Dialysis. Antibiotic Production. 4. Higher Order Equations. Second-Order Equations: An Introduction. Solutions of Second-Order Linear Homogeneous Equations with Constant Coefficients. Higher Order Equations: An Introduction. Solutions to Higher Order Linear Homogeneous Equations with Constant Coefficients. Introduction to Solving Nonhomogeneous Equations with Constant Coefficients: Method of Undetermined Coefficients. Nonhomogeneous Equations with Constant Coefficients: Variation of Parameters. Cauchy-Euler Equations. Series Solutions of Ordinary Differential Equations. Summary. Review Exercises. Differential Equations at Work. Testing for Diabetes. Modeling the Motion of a Skier. The Schröinger Equation. 5. Applications of Higher Order Equations. Simple Harmonic Motion. Damped Motion. Forced Motion. Other Applications. The Pendulum Problem. Summary. Review Exercises. Differential Equations at Work. Rack-and-Gear Systems. Soft Springs. Hard Springs. Aging Springs. Bodé Plots. 6. Systems of First Order Equations. Introduction. Review of Matrix Algebra and Calculus. Preliminary Definitions and Notation. First-Order Linear Homogeneous Systems with Constant Coefficients. First-Order Linear Nonhomogeneous Systems: Undetermined Coefficients and Variation of Parameters. Phase Portraits. Nonlinear Systems. Numerical Methods. Summary. Review Exercises. Differential Equations at Work. Modeling a Fox Population in Which Rabies is Present. Controlling the Spread of Disease. FitzHugh-Nagumo Model. 7. Applications of First-Order Systems. Mechanical and Electrical Problems with First-Order Linear Systems. Diffusion and Population Problems with First-Order Linear Systems. Nonlinear Systems of Equations. Summary. Review Exercises. Differential Equations at Work. Competing Species. Food Chains. Chemical Reactor. 8. Laplace Transforms. The Laplace Transform: Preliminary Definitions and Notation. Solving Initial-Value Problems with the Laplace Transform. Laplace Transforms of Several Important Functions. The Convolution Theorem. Laplace Transform Methods for Solving Systems. Applications Using Laplace Transforms. Summary. Review Exercises. Differential Equations at Work. The Tautochrone. Vibration Absorbers. Airplane Wing. Free Vibration of a Three-Story Building. Control Systems. 9. Fourier Series. Boundary-Value Problems, Eigenvalue Problems, Sturm-Liouville Problems. Fourier Sine Series and Cosine Series. Fourier Series. Generalized Fourier Series. Summary. Review Exercises. Differential Equations at Work. Free Vibration of a Three-Story Building. Forced Damped Spring-Mass System. Approximations with Fourier Series. 10. Partial Differential Equations. Introduction to Partial Differential

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Equations and Separation of Variables. The One-Dimensional Heat Equation. The One-Dimensional Wave Equation. Problems in Two Dimensions: Laplace's Equation. Two-Dimensional Problems in a Circular Region. Summary. Review Exercises. Differential Equations at Work. Laplace Transforms. Waves in a Steel Rod. Media Sterilization. Numerical Methods for Solving Partial Differential Equations. Answers to Selected Questions. Index.

An Introduction to Integral Transforms - Baidyanath Patra 2018-02-13

'An Introduction to Integral Transforms' is meant for students pursuing graduate and post graduate studies in Science and Engineering. It contains discussions on almost all transforms for normal users of the subject. The content of the book is explained from a rudimentary stand point to an advanced level for convenience of its readers. Pre-requisite for understanding the subject matter of the book is some knowledge on the complex variable techniques. Please note: Taylor & Francis does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka.

Fractional Differential Equations - Juan J. Nieto 2019-11-19

Fractional calculus provides the possibility of introducing integrals and derivatives of an arbitrary order in the mathematical modelling of physical processes, and it has become a relevant subject with applications to various fields, such as anomalous diffusion, propagation in different media, and propogation in relation to materials with different properties. However, many aspects from theoretical and practical points of view have still to be developed in relation to models based on fractional operators. This Special Issue is related to new developments on different aspects of fractional differential equations, both from a theoretical point of view and in terms of applications in different fields such as physics, chemistry, or control theory, for instance. The topics of the Issue include fractional calculus, the mathematical analysis of the properties of the solutions to fractional equations, the extension of classical approaches, or applications of fractional equations to several fields.

Fourier and Laplace Transforms - H. G. ter Morsche 2003-08-07

This textbook presents in a unified manner the fundamentals of both continuous and discrete versions of the Fourier and Laplace transforms. These transforms play an important role in the analysis of all kinds of physical phenomena. As a link between the various applications of these transforms the authors use the theory of signals and systems, as well as the theory of ordinary and partial differential equations. The book is divided into four major parts: periodic functions and Fourier series, non-periodic functions and the Fourier integral, switched-on signals and the Laplace transform, and finally the discrete versions of these transforms, in particular the Discrete Fourier Transform together with its fast implementation, and the z-transform. This textbook is designed for self-study. It includes many worked examples, together with more than 120 exercises, and will be of great value to undergraduates and graduate students in applied mathematics, electrical engineering, physics and computer science.

Applied Mechanics Reviews - 1974

Issues in Structural and Materials Engineering: 2011 Edition - 2012-01-09

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Methods of Applied Mathematics with a Software Overview - Jon H. Davis 2016-12-09

Broadly organized around the applications of

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Fourier analysis, "Methods of Applied Mathematics with a MATLAB Overview" covers both classical applications in partial differential equations and boundary value problems, as well as the concepts and methods associated to the Laplace, Fourier, and discrete transforms. Transform inversion problems are also examined, along with the necessary background in complex variables. A final chapter treats wavelets, short-time Fourier analysis, and geometrically-based transforms. The computer program MATLAB is emphasized throughout, and an introduction to MATLAB is provided in an appendix. Rich in examples, illustrations, and exercises of varying difficulty, this text can be used for a one- or two-semester course and is ideal for students in pure and applied mathematics, physics, and engineering.

Partial Differential Equations and Boundary-value Problems with Applications - Mark A. Pinsky 1998

Designed for the junior- and senior-level course in Partial Differential Equations, this new edition builds upon the solid strengths of the previous editions and has been revised to provide a more patient development of the core concepts. The material has been divided into three parts covering preliminary material, basic concepts, and advanced topics. Parts One and Two have also been reorganized and refined to provide more complete examples to help students master the content. The Sturm-Louiville Theory has been placed at the end of Chapter One and the coverage of infinite series and ordinary differential equations has been moved to an appendix.

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