The second edition of Analytical Fluid Dynamics presents an expanded and updated treatment of inviscid and laminar viscous compressible flows from a theoretical viewpoint. It emphasizes basic assumptions, the physical aspects of flow, and the appropriate formulations of the governing equations for subsequent analytical treatment. Topics covered include new edition of the popular textbook, comprehensively updated throughout and now includes a new dedicated website for gas dynamic calculations. The thoroughly revised and updated third edition of
Fundamentals of Gas Dynamics maintains the focus on gas flows below hypersonic. This targeted approach provides a cohesive and rigorous examination of most practical engineering problems in this gas dynamics flow regime. The conventional one-dimensional flow approach together with the role of temperature-entropy diagrams are highlighted throughout. The authors—note experts in the field—include a modern computational aid, illustrative charts and tables, and myriad examples of varying degrees of difficulty to aid in the understanding of the material presented. The updated edition of Fundamentals of Gas Dynamics includes new sections on the shock tube, the aerospike nozzle, and the gas dynamic laser. The book contains all equations, tables, and charts necessary to work the problems and exercises in each chapter. This book's accessible but rigorous style: Offers a comprehensively updated edition that includes new problems and examples Covers fundamentals of gas flows targeting those below hypersonic Presents the one-dimensional flow approach and highlights the role of temperature-entropy diagrams Contains new sections that examine the shock tube, the aerospike nozzle, the gas dynamic laser, and an expanded coverage of rocket propulsion Explores applications of gas dynamics to aircraft and rocket engines Includes behavioral objectives, summaries, and check tests to aid with learning Written for students in mechanical and aerospace engineering and professionals and researchers in the field, the third edition of Fundamentals of Gas Dynamics has been updated to include recent developments in the field and retains all its learning aids. The calculator for gas dynamics calculations is available at https://www.oscarbiblarz.com/gascalculator gas dynamics calculationsAn Introduction to Compressible Flow is a concise, yet comprehensive treatment of one-dimensional compressible flow designed to provide mechanical and aerospace engineering students with the background they need for aerodynamics and turbomachinery courses. This book covers isentropic flow, normal shock waves, oblique shock waves, and Prandtl-Meyer flow and their applications. The first chapter reviews the physics of air, control volume analysis and provides a review of thermodynamics. Most textbooks provide very concise treatments of compressible flow-this text will supplement that material, which is often too concise to provide students with the background they need. This book also supports practicing engineers who have never developed a mastery of issues related to one-dimensional compressible flow or who need to review this material at some point in their careers. The appendices provide the tables and charts commonly associated with this material. One new addition is an oblique shock table, which
tabulates the oblique shock angle for the weak shock solution as a function of Mach number and deflection angle. The book includes examples of problem solutions, and each chapter has a list of problems to enable students to apply their understanding. This revised and updated seventh edition continues to provide the most accessible and readable approach to the study of all the vital topics and issues associated with gas dynamic processes. At every stage, the physics governing the process, its applications and limitations are discussed in detail. With a strong emphasis on the basic concepts and problem-solving skills, this text is suitable for a course on Gas Dynamics/Compressible Flows/High-speed Aerodynamics at both undergraduate and postgraduate levels in aerospace engineering, mechanical engineering, chemical engineering and applied physics. The elegant and concise style of the book along with illustrations and worked-out examples makes it eminently suitable for self-study by students and also for scientists and engineers working in the field of gas dynamics in industries and research laboratories. The computer program to calculate the coordinates of contoured nozzle, with the method of characteristics, has been given in C-language. The program listing along with a sample output is given in the Appendix. NEW TO THE EDITION • A new chapter on the ‘Power of Compressible Bernoulli Equation’ • Extra chapter-end examples in Chapter 5 • Additional exercise problems in Chapters 5, 6, 7, and 8 KEY FEATURES • Concise coverage of the thermodynamic concepts to serve as a revision of the background material • Introduction to measurements in compressible flows and optical flow visualization techniques • Introduction to rarefied gas dynamics and high-temperature gas dynamics • Solutions Manual for instructors containing the complete worked-out solutions to chapter-end problems • In-depth presentation of potential equations for compressible flows, similarity rule and two-dimensional compressible flows • Logical and systematic treatment of fundamental aspects of gas dynamics, waves in the supersonic regime and gas dynamic processes TARGET AUDIENCE • BE/B.Tech (Mechanical Engineering, Aeronautical Engineering) • ME/M.Tech (Thermal Engineering, Aeronautical Engineering) As Computational Fluid Dynamics (CFD) and Computational Heat Transfer (CHT) evolve and become increasingly important in standard engineering design and analysis practice, users require a solid understanding of mechanics and numerical methods to make optimal use of available software. The Finite Element Method in Heat Transfer and Fluid Dynamics, Third Edition illustrates what a user must know to ensure the optimal application of computational procedures—particularly the Finite Element Method (FEM)—to important problems associated with
heat conduction, incompressible viscous flows, and convection heat transfer. This book follows the tradition of the bestselling previous editions, noted for their concise explanation and powerful presentation of useful methodology tailored for use in simulating CFD and CHT. The authors update research developments while retaining the previous editions' key material and popular style in regard to text organization, equation numbering, references, and symbols. This updated third edition features new or extended coverage of: Coupled problems and parallel processing Mathematical preliminaries and low-speed compressible flows Mode superposition methods and a more detailed account of radiation solution methods Variational multi-scale methods (VMM) and least-squares finite element models (LSFEM) Application of the finite element method to non-isothermal flows Formulation of low-speed, compressible flows With its presentation of realistic, applied examples of FEM in thermal and fluid design analysis, this proven masterwork is an invaluable tool for mastering basic methodology, competently using existing simulation software, and developing simpler special-purpose computer codes. It remains one of the very best resources for understanding numerical methods used in the study of fluid mechanics and heat transfer phenomena.

Numerical Methods for Partial Differential Equations: Finite Difference and Finite Volume Methods focuses on two popular deterministic methods for solving partial differential equations (PDEs), namely finite difference and finite volume methods. The solution of PDEs can be very challenging, depending on the type of equation, the number of independent variables, the boundary, and initial conditions, and other factors. These two methods have been traditionally used to solve problems involving fluid flow. For practical reasons, the finite element method, used more often for solving problems in solid mechanics, and covered extensively in various other texts, has been excluded. The book is intended for beginning graduate students and early career professionals, although advanced undergraduate students may find it equally useful. The material is meant to serve as a prerequisite for students who might go on to take additional courses in computational mechanics, computational fluid dynamics, or computational electromagnetics. The notations, language, and technical jargon used in the book can be easily understood by scientists and engineers who may not have had graduate-level applied mathematics or computer science courses. Presents one of the few available resources that comprehensively describes and demonstrates the finite volume method for unstructured mesh used frequently by practicing code developers in industry Includes step-by-step algorithms and code snippets in each chapter that
enables the reader to make the transition from equations on the page to working codes. Includes 51 worked out examples that comprehensively demonstrate important mathematical steps, algorithms, and coding practices required to numerically solve PDEs, as well as how to interpret the results from both physical and mathematic perspectives. For this edition, a number of typographical errors and minor slip-ups have been corrected. In addition, following the persistent encouragement of Olga Oleinik, I have added a new chapter, Chapter 25, which I titled "Recent Results." This chapter is divided into four sections, and in these I have discussed what I consider to be some of the important developments which have come about since the writing of the first edition. Section I deals with reaction-diffusion equations, and in it are described both the work of C. Jones, on the stability of the travelling wave for the Fitz-Hugh-Nagumo equations, and symmetry-breaking bifurcations. Section II deals with some recent results in shock-wave theory. The main topics considered are L. Tartar's notion of compensated compactness, together with its application to pairs of conservation laws, and T.-P. Liu's work on the stability of viscous profiles for shock waves. In the next section, Conley's connection index and connection matrix are described; these general notions are useful in constructing travelling waves for systems of nonlinear equations. The final section, Section IV, is devoted to the very recent results of C. Jones and R. Gardner, whereby they construct a general theory enabling them to locate the point spectrum of a wide class of linear operators which arise in stability problems for travelling waves. Their theory is general enough to be applicable to many interesting reaction-diffusion systems. This book is a self-contained text for those students and readers interested in learning hypersonic flow and high-temperature gas dynamics. It assumes no prior familiarity with either subject on the part of the reader. If you have never studied hypersonic and/or high-temperature gas dynamics before, and if you have never worked extensively in the area, then this book is for you. On the other hand, if you have worked and/or are working in these areas, and you want a cohesive presentation of the fundamentals, a development of important theory and techniques, a discussion of the salient results with emphasis on the physical aspects, and a presentation of modern thinking in these areas, then this book is also for you. In other words, this book is designed for two roles: 1) as an effective classroom text that can be used with ease by the instructor, and understood with ease by the student; and 2) as a viable, professional working tool for engineers, scientists, and managers who have any contact in their jobs with hypersonic and/or high-temperature flow. The aim of this book is
to present the concepts, methods and applications of kinetic theory to rarefied gas dynamics. After introducing the basic tools, problems in plane geometry are treated using approximation techniques (perturbation and numerical methods). These same techniques are later used to deal with two- and three-dimensional problems. The models include not only monatomic but also polyatomic gases, mixtures, chemical reactions. A special chapter is devoted to evaporation and condensation phenomena. Each section is accompanied by problems which are mainly intended to demonstrate the use of the material in the text and to outline additional subjects, results and equations. This will help ensure that the book can be used for a range of graduate courses in aerospace engineering or applied mathematics.
dissipation The second law of thermodynamics Calorically imperfect gas flows Aerodynamic sweep Shock-wave interference Unsteady one-dimensional flow Internal ballistics Force and momentum balance The Substitution Principle Rarefaction shock waves A comprehensive treatment of flow property derivatives just downstream of an unsteady three-dimensional shock Shock-generated vorticity Triple points An extended version of the Navier-Stokes equations Shock-free supersonic diffusers Lift and thrust from an asymmetric nozzle Analytical Fluid Dynamics, Third Edition outlines the basics of analytical fluid mechanics while emphasizing analytical approaches to fluid dynamics. Covering the material in-depth, this book provides an authoritative interpretation of formulations and procedures in analytical fluid dynamics, and offers analytical solutions to fluid dynamic problems. Partial differential equations (PDEs) play an important role in the natural sciences and technology, because they describe the way systems (natural and other) behave. The inherent suitability of PDEs to characterizing the nature, motion, and evolution of systems, has led to their wide-ranging use in numerical models that are developed in order to analyze systems that are not otherwise easily studied. Numerical Solutions for Partial Differential Equations contains all the details necessary for the reader to understand the principles and applications of advanced numerical methods for solving PDEs. In addition, it shows how the modern computer system algebra Mathematica® can be used for the analytic investigation of such numerical properties as stability, approximation, and dispersion. This self-contained book is an up-to-date description of the basic theory of molecular gas dynamics and its various applications. The book, unique in the literature, presents working knowledge, theory, techniques, and typical phenomena in rarefied gases for theoretical development and application. Basic theory is developed in a systematic way and presented in a form easily applied for practical use. In this work, the ghost effect and non-Navier–Stokes effects are demonstrated for typical examples—Bénard and Taylor–Couette problems—in the context of a new framework. A new type of ghost effect is also discussed. This edition of a very successful and widely adopted book has been brought up-to-date with computer methods and applications throughout. It makes use of spreadsheet programs, and contains unique procedures that have never appeared before in any gas dynamics book. KEY TOPICS Chapter topics include basic equations of compressible flow, wave propagation in compressible media, isentropic flow of a perfect gas, stationary and moving normal shock waves, oblique shock waves, flow with friction and with heat addition or heat loss, equations
of motion for multidimensional flow, methods of characteristics, special topics in gas dynamics, and measurement in compressible flow. MARKET: For mechanical and aerospace engineers. This textbook on Fundamentals of Gas Dynamics will help students with a background in mechanical and/or aerospace engineering and practicing engineers working in the areas of aerospace propulsion and gas dynamics by providing a rigorous examination of most practical engineering problems. The book focuses both on the basics and more complex topics such as quasi one dimensional flows, oblique shock waves, Prandtl-Meyer flow, flow of steam through nozzles, etc. End of chapter problems, solved illustrations and exercise problems are presented throughout the book to augment learning. *Many introductions to fluid dynamics offer an illustrative approach that demonstrates some aspects of fluid behavior, but often leave you without the tools necessary to confront new problems. For more than a decade, Fluid Dynamics: Theoretical and Computational Approaches has supplied these missing tools with a constructive approach that made the book a bestseller. Now in its third edition, it supplies even more computational skills in addition to a solid foundation in theory. After laying the groundwork in theoretical fluid dynamics, independent of any particular coordinate system in order to allow coordinate transformation of the equations, the author turns to the technique of writing Navier–Stokes and Euler’s equations, flow of inviscid fluids, laminar viscous flow, and turbulent flow. He also includes requisite mathematics in several “Mathematical Expositions” at the end of the book and provides abundant end-of-chapter problems. What’s New in the Third Edition? New section on free surface flow New section on instability of flows through Chaos and nonlinear dissipative systems New section on formulation of the large eddy simulation (LES) problem New example problems and exercises that reflect new and important topics of current interest By integrating a strong theoretical foundation with practical computational tools, Fluid Dynamics: Theoretical and Computational Approaches, Third Edition is an indispensable guide to the methods needed to solve new and unfamiliar problems in fluid dynamics. This important new book sets forth a comprehensive description of various mathematical aspects of problems originating in numerical solution of hyperbolic systems of partial differential equations. The authors present the material in the context of the important mechanical applications of such systems, including the Euler equations of gas dynamics, magnetohydrodynamics (MHD), shallow water, and solid dynamics equations. This treatment provides-for the first time in book form-a collection of recipes for applying higher-order non-oscillatory shock-capturing schemes to
MHD modelling of physical phenomena. The authors also address a number of original "nonclassical" problems, such as shock wave propagation in rods and composite materials, ionization fronts in plasma, and electromagnetic shock waves in magnets. They show that if a small-scale, higher-order mathematical model results in oscillations of the discontinuity structure, the variety of admissible discontinuities can exhibit disperse behavior, including some with additional boundary conditions that do not follow from the hyperbolic conservation laws. Nonclassical problems are accompanied by a multiple nonuniqueness of solutions. The authors formulate several selection rules, which in some cases easily allow a correct, physically realizable choice. This work systematizes methods for overcoming the difficulties inherent in the solution of hyperbolic systems. Its unique focus on applications, both traditional and new, makes Mathematical Aspects of Numerical Solution of Hyperbolic Systems particularly valuable not only to those interested the development of numerical methods, but to physicists and engineers who strive to solve increasingly complicated nonlinear equations. Thoroughly updated to include the latest developments in the field, this classic text on finite-difference and finite-volume computational methods maintains the fundamental concepts covered in the first edition. As an introductory text for advanced undergraduates and first-year graduate students, Computational Fluid Mechanics and Heat Transfer, Third Edition provides the background necessary for solving complex problems in fluid mechanics and heat transfer. Divided into two parts, the book first lays the groundwork for the essential concepts preceding the fluids equations in the second part. It includes expanded coverage of turbulence and large-eddy simulation (LES) and additional material included on detached-eddy simulation (DES) and direct numerical simulation (DNS). Designed as a valuable resource for practitioners and students, new homework problems have been added to further enhance the student’s understanding of the fundamentals and applications. Electroinduced Drift of Neutral Charge Clusters in Salt Solutions presents studies of the processes accompanying the effect of periodic electric and magnetic fields on salt solutions in polar dielectric liquids. The authors explain phenomena from a physical point of view, without theoretical constructions and mathematical calculations. This is done in order to make the book accessible to a wide audience and to help the reader navigate in a multilateral topic that is touched upon when studying processes that occur in liquid media under the external influence of an electromagnetic nature. Additional Features: Explores the phenomenon of selective drift of solvated ions in polar dielectric liquids Applies general
principles of electricity and magnetism to describe experimental results. Demonstrates how small perturbations of the equilibrium distribution determine not the corrections to the effects but the effects themselves. Approaches nonequilibrium molecular physics as a science of physical and chemical processes. This book will be useful to specialists, engineers, and graduate students, especially those recording and transmitting information in liquid media. This volume contains the lecture notes of the Short Course on Numerical Methods for Hyperbolic Equations, Faculty of Mathematics, University of Santiago de Compostela, Spain, 2-4 July 2011. The course was organized in recognition of Prof. Eleuterio Toro’s contribution to education and training on numerical methods for partial differential equation. This book is essentially a new edition, revised and augmented by results of the last decade, of the work of the same title published in 1968 by “Nauka.” It is devoted to mathematical questions of gas dynamics. Topics covered include Foundations of the Theory of Systems of Quasilinear Equations of Hyperbolic Type in Two Independent Variables; Classical and Generalized Solutions of One-Dimensional Gas Dynamics; Difference Methods for Solving the Equations of Gas Dynamics; and Generalized Solutions of Systems of Quasilinear Equations of Hyperbolic Type.

Proceedings of the Third Workshop on Computer Algebra in Scientific Computing, Samarkand, October 5-9, 2000. Similarity and Dimensional Methods in Mechanics, 10th Edition is an English language translation of this classic volume examining the general theory of dimensions of physical quantities, the theory of mechanical and physical similarity, and the theory of modeling. Several examples illustrate the use of the theories of similarity and dimensions for establishing fundamental mechanical regularities in aviation, explosions, and astrophysics, as well as in the hydrodynamics of ships. Other interesting areas covered include the general theory of automodel motions of continuum media, the theory of propagation of explosion waves in gases, the theory of one-dimensional nonestablished motion in gases, the fundamentals of the gas-dynamics theory of atom-bomb explosion in the atmosphere and the theory of averaging of gaseous flows in channels. Aspects of modeling include the dimensionless characteristics of compressor operation, the theories of engine thrust, and efficiency of an ideal propeller for subsonic and supersonic speeds. Similarity and Dimensional Methods in Mechanics, 10th Edition is an ideal volume for researchers and students involved in physics and mechanics.

For more than 50 years, the Springer VDI Heat Atlas has been an indispensable working means for engineers dealing with questions of heat transfer. Featuring 50% more content, this new edition covers most fields.
of heat transfer in industrial and engineering applications. It presents the interrelationships between basic
scientific methods, experimental techniques, model-based analysis and their transfer to technical
applications. Exact Solutions and Invariant Subspaces of Nonlinear Partial Differential Equations in Mechanics and
Physics is the first book to provide a systematic construction of exact solutions via linear invariant subspaces for
nonlinear differential operators. Acting as a guide to nonlinear evolution equations and models from physics and
mechanics, the book focuses on the existence of new exact solutions on linear invariant subspaces for nonlinear
operators and their crucial new properties. This practical reference deals with various partial differential equations
(PDEs) and models that exhibit some common nonlinear invariant features. It begins with classical as well as
more recent examples of solutions on invariant subspaces. In the remainder of the book, the authors develop
several techniques for constructing exact solutions of various nonlinear PDEs, including reaction-diffusion and gas
dynamics models, thin-film and Kuramoto-Sivashinsky equations, nonlinear dispersion (compacton) equations,
KdV-type and Harry Dym models, quasilinear magma equations, and Green-Naghdi equations. Using exact
solutions, they describe the evolution properties of blow-up or extinction phenomena, finite interface propagation,
and the oscillatory, changing sign behavior of weak solutions near interfaces for nonlinear PDEs of various types
and orders. The techniques surveyed in Exact Solutions and Invariant Subspaces of Nonlinear Partial Differential
Equations in Mechanics and Physics serve as a preliminary introduction to the general theory of nonlinear
evolution PDEs of different orders and types. From the reviews: "A unique feature of this book is the nice blend of
engineering vividness and mathematical rigour. [] The authors are to be congratulated for their valuable
contribution to the literature in the area of theoretical thermoelasticity and vibration of plates." Journal of Sound
and Vibration Two-Dimensional Separated Flows provides a systematic presentation of the theory of separated
flow around bodies. The main classes of aerodynamic problems of plane-parallel flow around bodies are
described, and the steady aerodynamic, unsteady aerodynamic, and statistical characteristics of a trailing wake
are determined. Numerical methods based on the synthesis of models for non-viscous incompressible flow and
boundary layer, algorithms, examples, and systematic comparisons are presented. The book also includes
numerical results for the problem of separated flow around fixed, oscillating, and rotating cylinders, in addition to
results for separated flow around an aerofoil over a wide range of angles. Two-Dimensional Separated Flows will
benefit researchers and students studying aerodynamics, aircraft dynamics, aeroelasticity, and the aerodynamics of building structures. A revised edition to applied gas dynamics with exclusive coverage on jets and additional sets of problems and examples. The revised and updated second edition of Applied Gas Dynamics offers an authoritative guide to the science of gas dynamics. Written by a noted expert on the topic, the text contains a comprehensive review of the topic; from a definition of the subject, to the three essential processes of this science: the isentropic process, shock and expansion process, and Fanno and Rayleigh flows. In this revised edition, there are additional worked examples that highlight many concepts, including moving shocks, and a section on critical Mach number is included that helps to illuminate the concept. The second edition also contains new exercise problems with the answers added. In addition, the information on ram jets is expanded with helpful worked examples. It explores the entire spectrum of the ram jet theory and includes a set of exercise problems to aid in the understanding of the theory presented. This important text: Includes a wealth of new solved examples that describe the features involved in the design of gas dynamic devices. Contains a chapter on jets; this is the first textbook material available on high-speed jets. Offers comprehensive and simultaneous coverage of both the theory and application. Includes additional information designed to help with an understanding of the material covered. Written for graduate students and advanced undergraduates in aerospace engineering and mechanical engineering, Applied Gas Dynamics, Second Edition expands on the original edition to include not only the basic information on the science of gas dynamics but also contains information on high-speed jets. The following text forms the proceedings of a conference. It is supposed to contain what was actually reported and discussed, though it does this, one hopes, in a polished and organized way. A sense of actuality, a reporting quality, makes this book different from a collection of review papers as, for example, a book in the series on Stars and Stellar Systems. All Invited Reports have been included as the Reporters wrote them. The Editor's task has been restricted to improving the presentation, a process which in most cases involved only minor revisions. In a few Reports the Editor did some heavy rewriting; in those cases he checked with the Reporters. Obviously a different course had to be taken with respect to the Discussions. They were recorded on tape, transcribed verbatim and then passed back to the discussants. After the discussants returned their versions, the Editor rearranged and condensed the texts and made a considerable effort to provide references. (Unfortunately he was not able to
locate all relevant Russian papers from 1968 and 1969. ) The Editor takes the responsibility for mistakes made in this process, which may have produced occasionally his own 'mix-master Universe'. Actually only a few discussion remarks were rejected, more often because of incomprehensibility, rather than because the remark was far from the subject of the Symposium, or was too long, or was too trivial. A few very long remarks have been condensed and put at the end of a Discussion.Numerical methods are indispensable tools in the analysis of complex fluid flows. This book focuses on computational techniques for high-speed gas flows, especially gas flows containing shocks and other steep gradients. The book decomposes complicated numerical methods into simple modular parts, showing how each part fits and how each method relates to or differs from others. The text begins with a review of gasdynamics and computational techniques. Next come basic principles of computational gasdynamics. The last two parts cover basic techniques and advanced techniques. Senior and graduate level students, especially in aerospace engineering, as well as researchers and practising engineers, will find a wealth of invaluable information on high-speed gas flows in this text. This volume presents the state of the art in several directions of research conducted by renowned mathematicians who participated in the research program on Nonlinear Partial Differential Equations at the Centre for Advanced Study at the Norwegian Academy of Science and Letters, Oslo, Norway, during the academic year 2008-09. The main theme of the volume is nonlinear partial differential equations that model a wide variety of wave phenomena. Topics discussed include systems of conservation laws, compressible Navier-Stokes equations, Navier-Stokes-Korteweg type systems in models for phase transitions, nonlinear evolution equations, degenerate/mixed type equations in fluid mechanics and differential geometry, nonlinear dispersive wave equations (Korteweg-de Vries, Camassa-Holm type, etc.), and Poisson interface problems and level set formulations. This 1992 book provides a coherent and comprehensive treatment of the thermodynamics and gas dynamics of the practical Stirling cycle. Invented in 1816, the Stirling engine is the subject of worldwide research and development on account of unique qualities - silence, indifference to heat source, low level of emissions when burning conventional fuels and an ability to function in reverse as heat pump or refrigerator. The student of engineering will discover an instructive and illuminating case study revealing the interactions of basic disciplines. The researcher will find the groundwork prepared for various types of computer simulation, Those involved in the use and teaching of solution methods for unsteady gas dynamics
problems will find a comprehensive treatment on nonlinear and linear wave approaches, for the Stirling machine provides an elegant example of the application of each. The book will be of use to all those involved in researching, designing or manufacturing Stirling prime movers, coolers and related regenerative thermal machines. This book provides a concise treatment of the theory of nonlinear evolutionary partial differential equations. It provides a rigorous analysis of non-Newtonian fluids, and outlines its results for applications in physics, biology, and mechanical engineering. The last decade has seen a dramatic increase of our abilities to solve numerically the governing equations of fluid mechanics. In design aerodynamics the classical potential-flow methods have been complemented by higher modelling-level methods. Euler solvers, and for special purposes, already Navier-Stokes solvers are in use. The authors of this book have been working on the solution of the Euler equations for quite some time. While the first two of us have worked mainly on algorithmic problems, the third has been concerned off and on with modelling and application problems of Euler methods. When we started to write this book we decided to put our own work at the center of it. This was done because we thought, and we leave this to the reader to decide, that our work has attained over the years enough substance in order to justify a book. The problem which we soon faced, was that the field still is moving at a fast pace, for instance because hypersonic computation problems became more and more important.

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