Dr Eulers Fabulous Formula Cures Many Mathematical Ills Paul J Nahin

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Walter Gautschi, Volume 3 Springer Science & Business Media
In the mid-eighteenth century, Swiss-born mathematician Leonhard Euler developed a formula so innovative and complex that it continues to inspire research, discussion, and even the occasional limerick. Dr. Euler's Fabulous Formula shares the fascinating story of this groundbreaking formula—long regarded as the gold standard for mathematical beauty—and shows why it still lies at the heart of complex number theory. In some ways a sequel to Nahin's An Imaginary Tale, this book examines the many applications of complex numbers alongside intriguing stories from the history of mathematics. Dr. Euler's Fabulous Formula is accessible to any reader familiar with calculus and differential equations, and promises to inspire mathematicians for years to come.

A Most Elegant Equation Springer Nature
This textbook serves as an introduction to groups, rings, fields, vector and tensor spaces, algebras, topological spaces, differentiable manifolds and Lie groups --- mathematical structures which are foundational to modern theoretical physics. It is aimed primarily at undergraduate students in physics and mathematics with no previous background in these topics. Applications to physics --- such as the metric tensor of special relativity, the symplectic structures associated with Hamilton's equations and the Generalized Stokes's Theorem --- appear at appropriate places in the text. Worked examples, end-of-chapter problems (many with hints and some with answers) and guides to further reading make this an excellent book for self-study. Upon completing this book the reader will be well prepared to delve more deeply into advanced texts and specialized monographs in theoretical physics or mathematics.

Dr. Euler's Fabulous Formula Academic Press

This highly comprehensive handbook provides a substantial advance in the computation of elementary and special functions of mathematics, extending the function coverage of major programming languages well beyond their international standards, including full support for decimal floating-point arithmetic. Written with clarity and focusing on the C language, the work pays extensive attention to little-understood aspects of floating-point and integer arithmetic, and to software portability, as well as to important historical architectures. It extends support to a future 256-bit, floating-point format offering 70 decimal digits of precision. Select Topics and Features: references an exceptionally useful, author-maintained MathCW website, containing source code for the book ' s software, compiled libraries for numerous systems, pre-built C compilers, and other related materials; offers a unique approach to covering mathematical-function computation using decimal arithmetic; provides extremely versatile appendices for interfaces to numerous other languages: Ada, C#, C++, Fortran, Java, and Pascal; presupposes only basic familiarity with computer programming in a common language, as well as early level algebra; supplies a library that readily adapts for existing scripting languages, with minimal effort; supports both binary and decimal arithmetic, in up to 10 different floating-point formats; covers a significant portion (with highly accurate implementations) of the U.S National Institute of Standards and Technology ' s 10-year project to codify mathematical functions. This highly practical text/reference is an invaluable tool for advanced undergraduates, recording many lessons of the intermingled history of computer hardw are and software, numerical algorithms, and mathematics. In addition, professional numerical analysts and others will find the handbook of real interest and utility because it builds on research by the mathematical software community over the last four decades.

The Mathematical-Function Computation Handbook CRC Press

The interest earned on a bank account, the arrangement of seeds in a sunflower, and the shape of the Gateway Arch in St. Louis are all intimately connected with the mysterious number e. In this informal and engaging history, Eli Maor portrays the curious characters and the elegant mathematics that lie behind the number. Designed for a reader with only a modest mathematical background, this biography brings out the central importance of e to mathematics and illuminates a golden era in the age of science.

A Modern Introduction to Linear Algebra Princeton University Press

What's the point of calculating definite integrals since you can't possibly do them all? What makes doing the specific integrals in this book of value aren't the specific answers we'll obtain, but rather the methods we'll use in obtaining those answers; methods you can use for evaluating the integrals you will encounter in the future. This book, now in its second edition, is written in a light-hearted manner for students who have completed the first year of college or high school AP calculus and have just a bit of exposure to the concept of a differential equation. Every result is fully derived. If you are fascinated by definite integrals, then this is a book for you. New material in the second edition includes 25 new challenge problems and solutions, 25 new worked examples, simplified derivations, and additional historical discussion.

Waves and Rays in Elastic Continua Princeton University Press

An entertaining mathematical exploration of the heat equation and its role in the triumphant development of the trans-Atlantic telegraph cable Heat, like gravity, shapes nearly every aspect of our world and universe, from how milk dissolves in coffee to how molten planets cool. The heat equation, a cornerstone of modern physics, demystifies such processes, painting a mathematical picture of the way heat diffuses through matter. Presenting the mathematics and history behind the heat equation, Hot Molecules, Cold Electrons tells the remarkable story of how this foundational idea brought about one of the greatest technological advancements of the modern era. Paul Nahin vividly recounts the heat equation's tremendous influence on society, showing how French mathematical physicist Joseph Fourier discovered, derived, and solved the equation in the early nineteenth century. Nahin then follows Scottish physicist William Thomson, whose further analysis of Fourier's explorations led to the pioneering trans-Atlantic telegraph cable. This feat of engineering reduced the time it took to send a message across the ocean from weeks to minutes. Readers also learn that Thomson used Fourier's solutions to calculate the age of the earth, and, in a bit of colorful lore, that writer Charles Dickens relied on the trans-Atlantic cable to save himself from a career-damaging scandal. The book's mathematical and scientific explorations can be easily understood by anyone with a basic knowledge of high school calculus and physics, and MATLAB code is included to aid readers who would like to solve the heat equation themselves. A testament to the intricate links between mathematics and physics, Hot Molecules, Cold Electrons offers a fascinating glimpse into the relationship between a formative equation and one of the most important developments in the history of human communication.

A Modern Introduction to Differential Equations Springer Science & Business Media

The Atomic Space Age has been and continues to be an engine for future wealth creation. Humanity stands on the verge of becoming an interplanetary species. We know we are made of star-stuff precisely because many of the isotopes in our bodies originated in the death throes of dying suns. With the discovery of nuclear fission in 1938, mankind was for the first time able to glimpse both our distant past and our possible future. As with the discovery of fire and agriculture thousands of years ago, wind power hundreds of years ago, and steam power and electricity in the nineteenth century, we must now learn to tame this powerful new force locked within the heart of the atom. Buckminster Fuller once observed that wealth is nothing more than energy compounded by ingenuity. Since (mass-)energy can never decrease, and ingenuity will only increase, there is no limit to the quantity of wealth that our species can and will create using nuclear space propulsion.

e: The Story of a Number Oxford University Press, USA

This gives comprehensive coverage of the essential differential equations students they are likely to encounter in solving engineering and mechanics problems across the field -- alongside a more advance volume on applications. This first volume covers a very broad range of theories related to solving differential equations, mathematical preliminaries, ODE (n-th order and system of 1st order ODE in matrix form), PDE (1st order, 2nd, and higher order including wave, diffusion, potential, biharmonic equations and more). Plus more advanced topics such as Green's function method, integral and integro-differential equations, asymptotic expansion and perturbation, calculus of variations, variational and related methods, finite difference and numerical methods. All readers who are concerned with and interested in engineering mechanics

problems, climate change, and nanotechnology will find topics covered in these books providing valuable information and mathematics background for their multi-disciplinary research and education.

Inside Interesting Integrals Princeton University Press

This volume contains the proceedings of the Building Bridges: 3rd EU/US Summer School and Workshop on Automorphic Forms and Related Topics, which was held in Sarajevo from July 11–22, 2016. The articles summarize material which was presented during the lectures and speed talks during the workshop. These articles address various aspects of the theory of automorphic forms and its relations with the theory of L-functions, the theory of elliptic curves, and representation theory. In addition to mathematical content, the workshop held a panel discussion on diversity and inclusion, which was chaired by a social scientist who has contributed to this volume as well. This volume is intended for researchers interested in expanding their own areas of focus, thus allowing them to “build bridges” to mathematical questions in other fields.

An Equation for Every Occasion Springer

Walter Gautschi has written extensively on topics ranging from special functions, quadrature and orthogonal polynomials to difference and differential equations, software implementations, and the history of mathematics. He is world renowned for his pioneering work in numerical analysis and constructive orthogonal polynomials, including a definitive textbook in the former, and a monograph in the latter area. This three-volume set, Walter Gautschi: Selected Works with Commentaries, is a compilation of Gautschi’s most influential papers and includes commentaries by leading experts. The work begins with a detailed biographical section and ends with a section commemorating Walter’s prematurely deceased twin brother. This title will appeal to graduate students and researchers in numerical analysis, as well as to historians of science. Selected Works with Commentaries, Vol. 1 Numerical Conditioning Special Functions Interpolation and Approximation Selected Works with Commentaries, Vol. 2 Orthogonal Polynomials on the Real Line Orthogonal Polynomials on the Semicircle Chebyshev Quadrature Kronrod and Other Quadratures Gauss-type Quadrature Selected Works with Commentaries, Vol. 3 Linear Difference Equations Ordinary Differential Equations Software History and Biography Miscellanea Works of Werner Gautschi

Can We Believe in People Springer

A little math, a bit of history, and a dose of storytelling combine to reveal the importance of equations in everyday life. With this fun romp through the world of equations we encounter in our everyday lives, you’ll find yourself flipping through the stories of fifty-two formulas faster than a deck of cards. John M. Henshaw’s intriguing true accounts, each inspired by a different mathematical equation, are both succinct and easy to read. His tales come from the spheres of sports, business, history, the arts, science, and technology. Anecdotes about famous equations, like E=mc2, appear alongside tales of not-so-famous—but equally fascinating—equations, such as the one used to determine the SPF number for sunscreen. Drawn from the

breadth of human endeavor, Henshaw's stories demonstrate the power and utility of math. He entertains us by exploring the ways that equations can be used to explain, among other things, Ponzi schemes, the placebo effect, “dog years,” IQ, the wave mechanics of tsunamis, the troubled modern beekeeping industry, and the Challenger disaster. Smartly conceived and fast paced, his book offers something for anyone curious about math and its impacts.

Leonhard Euler JHU Press

This book outlines concepts such as population variability, population stability, population viability and persistance, and harvest yield. Also addressed are specific applications to conservation such as managing species at risk, fishery management, and the spatial manageement of marine resources.--Adapted from back cover.

Dr. Euler's Fabulous Formula Princeton University Press

This book addresses the nature of sound, focusing on the characteristics of sound waves in the context of time structures. This time domain approach provides an informative and intuitively understandable description of various acoustic topics such as sound waves travelling in an acoustic tube or in other media where spectral or modal analysis can be intensively performed. Starting from the introductory topic of sinusoidal waves, it discusses the formal relationship between the time and frequency domains, summarizing the fundamental notions of Fourier or z-transformations and linear systems theory, along with interesting examples from acoustical research. The books novel approach is of interest to research engineers and scientists In particular, the expressions concerning waveforms including the impulse responses are important for audio engineers who are familiar with digital signal analysis. Every chapter includes simple exercises designed to be solved without the need for a computer. Thus they help reconfirm the fundamental ideas and notions present in every chapter. The book is self-contained and concise, and requires only basic knowledge of acoustics and signal processing, making it valuable as a textbook for graduate and undergraduate university courses.

Euler's Pioneering Equation Princeton University Press

The power and properties of numbers, from basic addition and sums of squares to cutting-edge theory We use addition on a daily basis—yet how many of us stop to truly consider the enormous and remarkable ramifications of this mathematical activity? Summing It Up uses addition as a springboard to present a fascinating and accessible look at numbers and number theory, and how we apply beautiful numerical properties to answer math problems. Mathematicians Avner Ash and Robert Gross explore addition's most basic characteristics as well as the addition of squares and other powers before moving onward to infinite series, modular forms, and issues at the forefront of current mathematical research. Ash and Gross tailor their succinct and engaging investigations for math enthusiasts of all backgrounds. Employing college algebra, the first part of the book examines such questions as, can all positive numbers be written as a sum of four perfect squares? The

second section of the book incorporates calculus and examines infinite series—long sums that can only be defined by the concept of limit, as in the example of 1+1/2+1/4+. . .=? With the help of some group theory and geometry, the third section ties together the first two parts of the book through a discussion of modular forms—the analytic functions on the upper half-plane of the complex numbers that have growth and transformation properties. Ash and Gross show how modular forms are indispensable in modern number theory, for example in the proof of Fermat's Last Theorem. Appropriate for numbers novices as well as college math majors, Summing It Up delves into mathematics that will enlighten anyone fascinated by numbers.

Nonlinear Dynamics in Complex Systems Princeton University Press

With many areas of science reaching across their boundaries and becoming more and more interdisciplinary, students and researchers in these fields are confronted with techniques and tools not covered by their particular education. Especially in the life- and neurosciences quantitative models based on nonlinear dynamics and complex systems are becoming as frequently implemented as traditional statistical analysis. Unfamiliarity with the terminology and rigorous mathematics may discourage many scientists to adopt these methods for their own work, even though such reluctance in most cases is not justified. This book bridges this gap by introducing the procedures and methods used for analyzing nonlinear dynamical systems. In Part I, the concepts of fixed points, phase space, stability and transitions, among others, are discussed in great detail and implemented on the basis of example elementary systems. Part II is devoted to specific, non-trivial applications: coordination of human limb movement (Haken-Kelso-Bunz model), self-organization and pattern formation in complex systems (Synergetics), and models of dynamical properties of neurons (Hodgkin-Huxley, Fitzhugh-Nagumo and Hindmarsh-Rose). Part III may serve as a refresher and companion of some mathematical basics that have been forgotten or were not covered in basic math courses. Finally, the appendix contains an explicit derivation and basic numerical methods together with some programming examples as well as solutions to the exercises provided at the end of certain chapters. Throughout this book all derivations are as detailed and explicit as possible, and everybody with some knowledge of calculus should be able to extract meaningful guidance follow and apply the methods of nonlinear dynamics to their own work. “This book is a masterful treatment, one might even say a gift, to the interdisciplinary scientist of the future.” “With the authoritative voice of a genuine practitioner, Fuchs is a master teacher of how to handle complex dynamical systems.” “What I find beautiful in this book is its clarity, the clear definition of terms, every step explained simply and systematically.” (J.A.Scott Kelso, excerpts from the foreword)

Particles and Waves in Electron Optics and Microscopy Angelico Press

This monograph addresses the question of the increasing irrelevance of philosophy, which has seen scientists as well as philosophers concluding that philosophy is dead and has dissolved into the sciences. It seeks to answer the question of whether or not philosophy can still be fruitful and what kind of philosophy can be such. The author argues that from its very

beginning philosophy has focused on knowledge and methods for acquiring knowledge. This view, however, has generally been abandoned in the last century with the belief that, unlike the sciences, philosophy makes no observations or experiments and requires only thought. Thus, in order for philosophy to once again be relevant, it needs to return to its roots and focus on knowledge as well as methods for acquiring knowledge. Accordingly, this book deals with several questions about knowledge that are essential to this view of philosophy, including mathematical knowledge. Coverage examines such issues as the nature of knowledge; plausibility and common sense; knowledge as problem solving; modeling scientific knowledge; mathematical objects, definitions, diagrams; mathematics and reality; and more. This monograph presents a new approach to philosophy, epistemology, and the philosophy of mathematics. It will appeal to graduate students and researchers with interests in the role of knowledge, the analytic method, models of science, and mathematics and reality.

Automorphic Forms and Related Topics World Scientific
This book contains a multitude of challenging problems and solutions that are not commonly found in classical textbooks. One goal of the book is to present these fascinating mathematical problems in a new and engaging way and illustrate the connections between integrals, sums, and series, many of which involve zeta functions, harmonic series, polylogarithms, and various other special functions and constants. Throughout the book, the reader will find both classical and new problems, with numerous original problems and solutions coming from the personal research of the author. Where classical problems are concerned, such as those given in Olympiads or proposed by famous mathematicians like Ramanujan, the author has come up with new, surprising or unconventional ways of obtaining the desired results. The book begins with a lively foreword by renowned author Paul Nahin and is accessible to those with a good knowledge of calculus from undergraduate students to researchers, and will appeal to all mathematical puzzlers who love a good integral or series.

When Least Is Best Springer
"This is the first full-scale biography of Leonhard Euler (1707-83), one of the greatest mathematicians and theoretical physicists of all time. In this comprehensive and authoritative account, Ronald Calinger connects the story of Euler's eventful life to the astonishing achievements that place him in the company of Archimedes, Newton, and Gauss. Drawing chiefly on Euler's massive published works and correspondence, which fill more than eighty volumes so far, this biography sets Euler's work in its multilayered context--personal, intellectual, institutional, political, cultural, religious, and social. It is a story of nearly incessant accomplishment, from Euler's fundamental contributions to almost every area of pure and applied mathematics--especially calculus, number theory, notation, optics, and celestial, rational, and fluid mechanics--to his advancements in shipbuilding, telescopes, ballistics, cartography, chronology, and music theory. The narrative takes the reader from Euler's childhood and education in Basel through his first period in St. Petersburg, 1727-41, where he gained a European reputation by solving the Basel problem and

systematically developing analytical mechanics. Invited to Berlin by Frederick II, Euler published his famous Introductio in analysin infinitorum, devised continuum mechanics, and proposed a pulse theory of light. Returning to St. Petersburg in 1766, he created the analytical calculus of variations, developed the most precise lunar theory of the time that supported Newton's dynamics, and published the best-selling Letters to a German Princess--all despite eye problems that ended in near-total blindness. In telling the remarkable story of Euler and how his achievements brought pan-European distinction to the Petersburg and Berlin academies of sciences, the book also demonstrates with new depth and detail the central role of mathematics in the Enlightenment."--Publisher's description.

Rethinking Knowledge #N/A

Jonathan Edwards' theologically sophisticated psychology of grace remains one of the deepest and most fertile theological psychologies in the Protestant tradition. The heart of his account lies in his foundational doctrine of spiritual perception where he locates the psychological core of the engraced Christian life. This work revisits Edwards' doctrine from the perspective of recent work in the philosophy of emotions and other related philosophical sub-disciplines. The aim is to recover this often neglected theme in contemporary theology and renew it by bringing Edwards' theological insights into conversation with various spheres of contemporary philosophical discussion. The account of spiritual perception that emerges from this interdisciplinary dialogue is one that seeks to revise, update and deepen Edwards' own thinking on the matter in five major ways. The book concludes by arguing that the capacity for spiritual and emotional perception of the supreme good is grounded upon a wisdom-like seminal virtue centred upon the incarnate Christ (i.e., Christocentric wisdom). Such wisdom, on the renewed account, is considered the psychological core of transforming grace and the foundational basis upon which all other Christian virtues are formed.

Modern Communications Receiver Design and Technology Springer Science & Business Media

This book is more than a mathematics textbook. It discusses various kinds of numbers and curious interconnections between them. Without getting into hardcore and difficult mathematical technicalities, the book lucidly introduces all kinds of numbers that mathematicians have created. Interesting anecdotes involving great mathematicians and their marvelous creations are included. The reader will get a glimpse of the thought process behind the invention of new mathematics. Starting from natural numbers, the book discusses integers, real numbers, imaginary and complex numbers and some special numbers like quaternions, dual numbers and p-adic numbers. Real numbers include rational, irrational and transcendental numbers. Iterations on real numbers are shown to throw up some unexpected behavior, which has given rise to the new science of "Chaos". Special numbers like e, pi, golden ratio, Euler's constant, Gauss's constant, amongst others, are discussed in great detail. The origin of imaginary numbers and the use of complex numbers constitute the next topic. It is shown why modern mathematics cannot even be imagined without imaginary numbers. Iterations on complex numbers are shown to generate a new mathematical object called 'Fractal', which is ubiquitous in nature. Finally, some very special numbers, not mentioned in the usual textbooks, and their applications, are introduced at an elementary level. The level of mathematics discussed in this book is easily accessible to young adults interested in mathematics, high school students, and adults having some interest in basic mathematics. The book concentrates more on the

story than on rigorous mathematics.