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KEY=SOLUTION - DAUGHERTY KENNEDI

STUDENT SOLUTIONS MANUAL FOR NONLINEAR DYNAMICS AND CHAOS, 2ND EDITION

CRC Press This official Student Solutions Manual includes solutions to the odd-numbered exercises featured in the second edition of Steven Strogatz's classic text **Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering**. The textbook and accompanying Student Solutions Manual are aimed at newcomers to nonlinear dynamics and chaos, especially students taking a first course in the subject. Complete with graphs and worked-out solutions, this manual demonstrates techniques for students to analyze differential equations, bifurcations, chaos, fractals, and other subjects Strogatz explores in his popular book.

NONLINEAR DYNAMICS AND CHAOS

WITH APPLICATIONS TO PHYSICS, BIOLOGY, CHEMISTRY, AND ENGINEERING

CRC Press This textbook is aimed at newcomers to nonlinear dynamics and chaos, especially students taking a first course in the subject. The presentation stresses analytical methods, concrete examples, and geometric intuition. The theory is developed systematically, starting with first-order differential equations and their bifurcations, followed by phase

plane analysis, limit cycles and their bifurcations, and culminating with the Lorenz equations, chaos, iterated maps, period doubling, renormalization, fractals, and strange attractors.

STUDENT SOLUTIONS MANUAL FOR NONLINEAR DYNAMICS AND CHAOS, 2ND EDITION

Westview Press This Student Solutions Manual contains solutions to the odd-numbered exercises in *Nonlinear Dynamics and Chaos*, second edition.

PROBLEMS AND SOLUTIONS

NONLINEAR DYNAMICS, CHAOS AND FRACTALS

World Scientific Publishing Company This book presents a collection of problems for nonlinear dynamics, chaos theory and fractals. Besides the solved problems, supplementary problems are also added. Each chapter contains an introduction with suitable definitions and explanations to tackle the problems. The material is self-contained, and the topics range in difficulty from elementary to advanced. While students can learn important principles and strategies required for problem solving, lecturers will also find this text useful, either as a supplement or text, since concepts and techniques are developed in the problems.

INTRODUCTION TO APPLIED NONLINEAR DYNAMICAL SYSTEMS AND CHAOS

Springer Science & Business Media This introduction to applied nonlinear dynamics and chaos places emphasis on teaching the techniques and ideas that will enable students to take specific dynamical systems and obtain some quantitative information about their behavior. The new edition has been updated and extended throughout, and contains a detailed glossary of terms. From the reviews: "Will serve as one of the most eminent introductions to the geometric theory of dynamical systems." -- *Monatshefte für Mathematik*

CHAOS AND NONLINEAR DYNAMICS

AN INTRODUCTION FOR SCIENTISTS AND ENGINEERS

Oxford University Press on Demand *Chaos and Nonlinear Dynamics* is a comprehensive introduction to the exciting scientific field of nonlinear dynamics for students, scientists, and engineers, and requires only minimal prerequisites in physics and mathematics. The book treats all the important areas in the field and provides an extensive and up-to-date bibliography of applications in all fields of science, social science, economics, and even the arts.

STUDENT SOLUTIONS MANUAL FOR NONLINEAR D

A FIRST COURSE IN DISCRETE DYNAMICAL SYSTEMS

Springer Science & Business Media Given the ease with which computers can do iteration it is now possible for almost anyone to generate beautiful images whose roots lie in discrete dynamical systems. Images of Mandelbrot and Julia sets abound in publications both mathematical and not. The mathematics behind the pictures are beautiful in their own right and are the subject of this text. Mathematica programs that illustrate the dynamics are included in an appendix.

DIFFERENTIAL DYNAMICAL SYSTEMS

SIAM Differential equations are the basis for models of any physical systems that exhibit smooth change. This book combines much of the material found in a traditional course on ordinary differential equations with an introduction to the more modern theory of dynamical systems. Applications of this theory to physics, biology, chemistry, and engineering are shown through examples in such areas as population modeling, fluid dynamics, electronics, and mechanics. *Differential Dynamical Systems* begins with coverage of linear systems, including matrix algebra; the focus then shifts to foundational material on nonlinear differential equations, making heavy use of the contraction-mapping theorem. Subsequent chapters deal specifically with dynamical systems concepts: flow, stability, invariant manifolds, the phase plane, bifurcation, chaos, and Hamiltonian dynamics. Throughout the book, the author includes exercises to help students develop an analytical and geometrical understanding of dynamics. Many of the exercises and examples are based on applications and some involve computation; an appendix offers simple codes written in Maple, Mathematica, and MATLAB software to give students practice with computation applied to dynamical systems problems. **Audience** This textbook is intended for senior undergraduates and first-year graduate students in pure and applied mathematics, engineering, and the physical sciences. Readers should be comfortable with elementary differential equations and linear algebra and should have had exposure to advanced calculus. **Contents** List of Figures; Preface; Acknowledgments; Chapter 1: Introduction; Chapter 2: Linear Systems; Chapter 3: Existence and Uniqueness; Chapter 4: Dynamical Systems; Chapter 5: Invariant Manifolds; Chapter 6: The Phase Plane; Chapter 7: Chaotic Dynamics; Chapter 8: Bifurcation Theory; Chapter 9: Hamiltonian Dynamics; Appendix: Mathematical Software; Bibliography; Index

CHAOS IN DYNAMICAL SYSTEMS

Cambridge University Press Over the past two decades scientists, mathematicians, and engineers have come to understand that a large variety of systems exhibit complicated evolution with time. This

complicated behavior is known as chaos. In the new edition of this classic textbook Edward Ott has added much new material and has significantly increased the number of homework problems. The most important change is the addition of a completely new chapter on control and synchronization of chaos. Other changes include new material on riddled basins of attraction, phase locking of globally coupled oscillators, fractal aspects of fluid advection by Lagrangian chaotic flows, magnetic dynamos, and strange nonchaotic attractors. This new edition will be of interest to advanced undergraduates and graduate students in science, engineering, and mathematics taking courses in chaotic dynamics, as well as to researchers in the subject.

DIFFERENTIAL EQUATIONS, DYNAMICAL SYSTEMS, AND AN INTRODUCTION TO CHAOS

Academic Press This text is about the dynamical aspects of ordinary differential equations and the relations between dynamical systems and certain fields outside pure mathematics. It is an update of one of Academic Press's most successful mathematics texts ever published, which has become the standard textbook for graduate courses in this area. The authors are tops in the field of advanced mathematics. Steve Smale is a Field's Medalist, which equates to being a Nobel prize winner in mathematics. Bob Devaney has authored several leading books in this subject area. Linear algebra prerequisites toned down from first edition Inclusion of analysis of examples of chaotic systems, including Lorenz, Rossler, and Shilnikov systems Bifurcation theory included throughout.

DYNAMICAL SYSTEMS WITH APPLICATIONS USING MATLAB®

Springer This textbook, now in its second edition, provides a broad introduction to both continuous and discrete dynamical systems, the theory of which is motivated by examples from a wide range of disciplines. It emphasizes applications and simulation utilizing MATLAB®, Simulink®, the Image Processing Toolbox® and the Symbolic Math toolbox®, including MuPAD. Features new to the second edition include · sections on series solutions of ordinary differential equations, perturbation methods, normal forms, Gröbner bases, and chaos synchronization; · chapters on image processing and binary oscillator computing; · hundreds of new illustrations, examples, and exercises with solutions; and · over eighty up-to-date MATLAB program files and Simulink model files available online. These files were voted MATLAB Central Pick of the Week in July 2013. The hands-on approach of Dynamical Systems with Applications using MATLAB, Second Edition, has minimal prerequisites, only requiring familiarity with ordinary differential equations. It will appeal to advanced undergraduate and graduate students, applied mathematicians, engineers, and researchers in a broad range of disciplines such as population dynamics, biology, chemistry, computing, economics, nonlinear optics, neural networks, and

physics. Praise for the first edition Summing up, it can be said that this text allows the reader to have an easy and quick start to the huge field of dynamical systems theory. MATLAB/SIMULINK facilitate this approach under the aspect of learning by doing. —OR News/Operations Research Spectrum The MATLAB programs are kept as simple as possible and the author's experience has shown that this method of teaching using MATLAB works well with computer laboratory classes of small sizes.... I recommend 'Dynamical Systems with Applications using MATLAB' as a good handbook for a diverse readership: graduates and professionals in mathematics, physics, science and engineering. —Mathematica

A FIRST COURSE IN CHAOTIC DYNAMICAL SYSTEMS

THEORY AND EXPERIMENT

CRC Press **A First Course in Chaotic Dynamical Systems: Theory and Experiment** is the first book to introduce modern topics in dynamical systems at the undergraduate level. Accessible to readers with only a background in calculus, the book integrates both theory and computer experiments into its coverage of contemporary ideas in dynamics. It is designed as a gradual introduction to the basic mathematical ideas behind such topics as chaos, fractals, Newton's method, symbolic dynamics, the Julia set, and the Mandelbrot set, and includes biographies of some of the leading researchers in the field of dynamical systems. Mathematical and computer experiments are integrated throughout the text to help illustrate the meaning of the theorems presented. Chaotic Dynamical Systems Software, Labs 1-6 is a supplementary laboratory software package, available separately, that allows a more intuitive understanding of the mathematics behind dynamical systems theory. Combined with **A First Course in Chaotic Dynamical Systems**, it leads to a rich understanding of this emerging field.

INFINITE POWERS

HOW CALCULUS REVEALS THE SECRETS OF THE UNIVERSE

Eamon Dolan Books From preeminent math personality and author of **The Joy of x** , a brilliant and endlessly appealing explanation of calculus - how it works and why it makes our lives immeasurably better. Without calculus, we wouldn't have cell phones, TV, GPS, or ultrasound. We wouldn't have unraveled DNA or discovered Neptune or figured out how to put 5,000 songs in your pocket. Though many of us were scared away from this essential, engrossing subject in high school and college, Steven Strogatz's brilliantly creative, down-to-earth history shows that calculus is not about complexity; it's about simplicity. It harnesses an unreal number--infinity--to tackle real-world problems, breaking them down into easier ones and then reassembling the answers into solutions that feel miraculous. **Infinite Powers** recounts how calculus tantalized and thrilled its inventors, starting

with its first glimmers in ancient Greece and bringing us right up to the discovery of gravitational waves (a phenomenon predicted by calculus). Strogatz reveals how this form of math rose to the challenges of each age: how to determine the area of a circle with only sand and a stick; how to explain why Mars goes "backwards" sometimes; how to make electricity with magnets; how to ensure your rocket doesn't miss the moon; how to turn the tide in the fight against AIDS. As Strogatz proves, calculus is truly the language of the universe. By unveiling the principles of that language, *Infinite Powers* makes us marvel at the world anew.

NONLINEAR OSCILLATIONS, DYNAMICAL SYSTEMS, AND BIFURCATIONS OF VECTOR FIELDS

Springer Science & Business Media An application of the techniques of dynamical systems and bifurcation theories to the study of nonlinear oscillations. Taking their cue from Poincare, the authors stress the geometrical and topological properties of solutions of differential equations and iterated maps. Numerous exercises, some of which require nontrivial algebraic manipulations and computer work, convey the important analytical underpinnings of problems in dynamical systems and help readers develop an intuitive feel for the properties involved.

THE JOY OF X

A GUIDED TOUR OF MATH, FROM ONE TO INFINITY

Houghton Mifflin Harcourt A comprehensive tour of leading mathematical ideas by an award-winning professor and columnist for the New York Times *Opinionator* series demonstrates how math intersects with philosophy, science and other aspects of everyday life. By the author of *The Calculus of Friendship*. 50,000 first printing.

NONLINEAR ORDINARY DIFFERENTIAL EQUATIONS

AN INTRODUCTION FOR SCIENTISTS AND ENGINEERS

Oxford University Press on Demand Thoroughly updated and expanded 4th edition of the classic text, including numerous worked examples, diagrams and exercises. An ideal resource for students and lecturers in engineering, mathematics and the sciences it is published alongside a separate *Problems and Solutions Sourcebook* containing over 500 problems and fully-worked solutions.

NONLINEAR DYNAMICAL SYSTEMS AND CHAOS

Birkhäuser Symmetries in dynamical systems, "KAM theory and other perturbation theories", "Infinite dimensional systems", "Time series analysis" and "Numerical continuation and bifurcation analysis" were the main topics of the December 1995 Dynamical Systems Conference held in

Groningen in honour of Johann Bernoulli. They now form the core of this work which seeks to present the state of the art in various branches of the theory of dynamical systems. A number of articles have a survey character whereas others deal with recent results in current research. It contains interesting material for all members of the dynamical systems community, ranging from geometric and analytic aspects from a mathematical point of view to applications in various sciences.

CLASSICAL MECHANICS

A COMPUTATIONAL APPROACH WITH EXAMPLES USING MATHEMATICA AND PYTHON

CRC Press **Classical Mechanics: A Computational Approach with Examples using Python and Mathematica** provides a unique, contemporary introduction to classical mechanics, with a focus on computational methods. In addition to providing clear and thorough coverage of key topics, this textbook includes integrated instructions and treatments of computation. Full of pedagogy, it contains both analytical and computational example problems within the body of each chapter. The example problems teach readers both analytical methods and how to use computer algebra systems and computer programming to solve problems in classical mechanics. End-of-chapter problems allow students to hone their skills in problem solving with and without the use of a computer. The methods presented in this book can then be used by students when solving problems in other fields both within and outside of physics. It is an ideal textbook for undergraduate students in physics, mathematics, and engineering studying classical mechanics. Features: Gives readers the "big picture" of classical mechanics and the importance of computation in the solution of problems in physics Numerous example problems using both analytical and computational methods, as well as explanations as to how and why specific techniques were used Online resources containing specific example codes to help students learn computational methods and write their own algorithms A solutions manual is available via the Routledge Instructor Hub and extra code is available via the Support Material tab

DYNAMICAL SYSTEMS

DIFFERENTIAL EQUATIONS, MAPS, AND CHAOTIC BEHAVIOUR

CRC Press This text discusses the qualitative properties of dynamical systems including both differential equations and maps. The approach taken relies heavily on examples (supported by extensive exercises, hints to solutions and diagrams) to develop the material, including a treatment of chaotic behavior. The unprecedented popular interest shown in recent years in the chaotic behavior of discrete dynamic systems including such topics as chaos and fractals has had its impact on the undergraduate and graduate curriculum. However there has, until now, been no text which

sets out this developing area of mathematics within the context of standard teaching of ordinary differential equations. Applications in physics, engineering, and geology are considered and introductions to fractal imaging and cellular automata are given.

SYNC

HOW ORDER EMERGES FROM CHAOS IN THE UNIVERSE, NATURE, AND DAILY LIFE

Hachette Books At the heart of the universe is a steady, insistent beat, the sound of cycles in sync. Along the tidal rivers of Malaysia, thousands of fireflies congregate and flash in unison; the moon spins in perfect resonance with its orbit around the earth; our hearts depend on the synchronous firing of ten thousand pacemaker cells. While the forces that synchronize the flashing of fireflies may seem to have nothing to do with our heart cells, there is in fact a deep connection. Synchrony is a science in its infancy, and Strogatz is a pioneer in this new frontier in which mathematicians and physicists attempt to pinpoint just how spontaneous order emerges from chaos. From underground caves in Texas where a French scientist spent six months alone tracking his sleep-wake cycle, to the home of a Dutch physicist who in 1665 discovered two of his pendulum clocks swinging in perfect time, this fascinating book spans disciplines, continents, and centuries. Engagingly written for readers of books such as *Chaos* and *The Elegant Universe*, *Sync* is a tour-de-force of nonfiction writing.

APPLIED COMPLEX ANALYSIS WITH PARTIAL DIFFERENTIAL EQUATIONS

This reader-friendly book presents traditional material using a modern approach that invites the use of technology. Abundant exercises, examples, and graphics make it a comprehensive and visually appealing resource. Chapter topics include complex numbers and functions, analytic functions, complex integration, complex series, residues: applications and theory, conformal mapping, partial differential equations: methods and applications, transform methods, and partial differential equations in polar and spherical coordinates. For engineers and physicists in need of a quick reference tool.

ADVANCED NUMERICAL METHODS WITH MATLAB 2

RESOLUTION OF NONLINEAR, DIFFERENTIAL AND PARTIAL DIFFERENTIAL EQUATIONS

John Wiley & Sons The purpose of this book is to introduce and study numerical methods basic and advanced ones for scientific computing. This last refers to the implementation of appropriate approaches to the

treatment of a scientific problem arising from physics (meteorology, pollution, etc.) or of engineering (mechanics of structures, mechanics of fluids, treatment signal, etc.). Each chapter of this book recalls the essence of the different methods resolution and presents several applications in the field of engineering as well as programs developed under Matlab software.

MODERN CLASSICAL MECHANICS

Cambridge University Press Presents classical mechanics as a thriving field with strong connections to modern physics, with numerous worked examples and homework problems.

AN INTRODUCTION TO DYNAMICAL SYSTEMS

CONTINUOUS AND DISCRETE

American Mathematical Soc. This book gives a mathematical treatment of the introduction to qualitative differential equations and discrete dynamical systems. The treatment includes theoretical proofs, methods of calculation, and applications. The two parts of the book, continuous time of differential equations and discrete time of dynamical systems, can be covered independently in one semester each or combined together into a year long course. The material on differential equations introduces the qualitative or geometric approach through a treatment of linear systems in any dimension. There follows chapters where equilibria are the most important feature, where scalar (energy) functions is the principal tool, where periodic orbits appear, and finally, chaotic systems of differential equations. The many different approaches are systematically introduced through examples and theorems. The material on discrete dynamical systems starts with maps of one variable and proceeds to systems in higher dimensions. The treatment starts with examples where the periodic points can be found explicitly and then introduces symbolic dynamics to analyze where they can be shown to exist but not given in explicit form. Chaotic systems are presented both mathematically and more computationally using Lyapunov exponents. With the one-dimensional maps as models, the multidimensional maps cover the same material in higher dimensions. This higher dimensional material is less computational and more conceptual and theoretical. The final chapter on fractals introduces various dimensions which is another computational tool for measuring the complexity of a system. It also treats iterated function systems which give examples of complicated sets. In the second edition of the book, much of the material has been rewritten to clarify the presentation. Also, some new material has been included in both parts of the book. This book can be used as a textbook for an advanced undergraduate course on ordinary differential equations and/or dynamical systems. Prerequisites are standard courses in calculus (single variable

and multivariable), linear algebra, and introductory differential equations.

AN INTRODUCTION TO CELESTIAL MECHANICS

Cambridge University Press **A clear, concise introduction to all the major features of solar system dynamics, ideal for a first course.**

INTRODUCTION TO MODERN DYNAMICS

CHAOS, NETWORKS, SPACE, AND TIME

Oxford University Press, USA **The best parts of physics are the last topics that our students ever see. These are the exciting new frontiers of nonlinear and complex systems that are at the forefront of university research and are the basis of many high-tech businesses. Topics such as traffic on the World Wide Web, the spread of epidemics through globally-mobile populations, or how the synchronization of global economies are governed by universal principles just as profound as Newton's laws. Nonetheless, the conventional university physics curriculum reserves most of these topics for graduate study because of the assumed need for advanced mathematics. However, by using only linear algebra and calculus, combined with exploratory computer simulations, all of these topics become accessible to advanced undergraduate students. The structure of this book combines the three main topics of modern dynamics - chaos theory, dynamics on complex networks, and general relativity - into a coherent framework. By taking a geometric view of physics, concentrating on the time evolution of physical systems as trajectories through abstract spaces, these topics share a common and simple mathematical language through which any student can gain a unified physical intuition. Given the growing importance of complex dynamical systems in many areas of science and technology, this text provides students with an up-to-date foundation for their future careers. This second edition has an updated introductory chapter and has added key topics to help students prepare for their GRE physics subject exam. It also has expanded chapters on Hamiltonian dynamics, Hamiltonian chaos, and Econophysics, while increasing the number of homework problems at the end of each chapter. The second edition is designed to fulfill the textbook needs of any advanced undergraduate course in mechanics.**

RANDOM DYNAMICAL SYSTEMS IN FINANCE

CRC Press **The theory and applications of random dynamical systems (RDS) are at the cutting edge of research in mathematics and economics, particularly in modeling the long-run evolution of economic systems subject to exogenous random shocks. Despite this interest, there are no books available that solely focus on RDS in finance and economics. Exploring this**

STUDENT SOLUTIONS MANUAL FOR STEWART/REDLIN/WATSON'S COLLEGE ALGEBRA, 6TH

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CHAOS AND NONLINEAR DYNAMICS

AN INTRODUCTION FOR SCIENTISTS AND ENGINEERS

Oxford University Press, USA **Mathematics of Computing -- Miscellaneous.**

LECTURES ON PHASE TRANSITIONS AND THE RENORMALIZATION GROUP

CRC Press **Covering the elementary aspects of the physics of phases transitions and the renormalization group, this popular book is widely used both for core graduate statistical mechanics courses as well as for more specialized courses. Emphasizing understanding and clarity rather than technical manipulation, these lectures de-mystify the subject and show precisely "how things work." Goldenfeld keeps in mind a reader who wants to understand why things are done, what the results are, and what in principle can go wrong. The book reaches both experimentalists and theorists, students and even active researchers, and assumes only a prior knowledge of statistical mechanics at the introductory graduate level. Advanced, never-before-printed topics on the applications of renormalization group far from equilibrium and to partial differential equations add to the uniqueness of this book.**

THERMOACOUSTIC INSTABILITY

A COMPLEX SYSTEMS PERSPECTIVE

Springer Nature **This book systematically presents the consolidated findings of the phenomenon of self-organization observed during the onset of thermoacoustic instability using approaches from dynamical systems and complex systems theory. Over the last decade, several complex dynamical states beyond limit cycle oscillations such as quasiperiodicity, frequency-locking, period-n, chaos, strange non-chaos, and intermittency have been discovered in thermoacoustic systems operated in laminar and turbulent flow regimes. During the onset of thermoacoustic instability in turbulent systems, an ordered acoustic field and large coherent vortices emerge from the background of turbulent combustion. This emergence of order from disorder in both temporal and spatiotemporal dynamics is explored in the contexts of synchronization, pattern formation, collective interaction, multifractality, and complex networks. For the past six decades, the spontaneous emergence of large amplitude, self-sustained, tonal oscillations in confined combustion systems, characterized as**

thermoacoustic instability, has remained one of the most challenging areas of research. The presence of such instabilities continues to hinder the development and deployment of high-performance combustion systems used in power generation and propulsion applications. Even with the advent of sophisticated measurement techniques to aid experimental investigations and vast improvements in computational power necessary to capture flow physics in high fidelity simulations, conventional reductionist approaches have not succeeded in explaining the plethora of dynamical behaviors and the associated complexities that arise in practical combustion systems. As a result, models and theories based on such approaches are limited in their application to mitigate or evade thermoacoustic instabilities, which continue to be among the biggest concerns for engine manufacturers today. This book helps to overcome these limitations by providing appropriate methodologies to deal with nonlinear thermoacoustic oscillations, and by developing control strategies that can mitigate and forewarn thermoacoustic instabilities. The book is also beneficial to scientists and engineers studying the occurrence of several other instabilities, such as flow-induced vibrations, compressor surge, aeroacoustics and aeroelastic instabilities in diverse fluid-mechanical environments, to graduate students who intend to apply dynamical systems and complex systems approach to their areas of research, and to physicists who look for experimental applications of their theoretical findings on nonlinear and complex systems.

CHAOTIC, FRACTIONAL, AND COMPLEX DYNAMICS: NEW INSIGHTS AND PERSPECTIVES

Springer The book presents nonlinear, chaotic and fractional dynamics, complex systems and networks, together with cutting-edge research on related topics. The fifteen chapters - written by leading scientists working in the areas of nonlinear, chaotic, and fractional dynamics, as well as complex systems and networks - offer an extensive overview of cutting-edge research on a range of topics, including fundamental and applied research. These include but are not limited to, aspects of synchronization in complex dynamical systems, universality features in systems with specific fractional dynamics, and chaotic scattering. As such, the book provides an excellent and timely snapshot of the current state of research, blending the insights and experiences of many prominent researchers.

THE INFORMATION

A HISTORY, A THEORY, A FLOOD

Vintage From the bestselling author of the acclaimed *Chaos and Genius* comes a thoughtful and provocative exploration of the big ideas of the modern era: Information, communication, and information theory. Acclaimed science writer James Gleick presents an eye-opening vision of

how our relationship to information has transformed the very nature of human consciousness. A fascinating intellectual journey through the history of communication and information, from the language of Africa's talking drums to the invention of written alphabets; from the electronic transmission of code to the origins of information theory, into the new information age and the current deluge of news, tweets, images, and blogs. Along the way, Gleick profiles key innovators, including Charles Babbage, Ada Lovelace, Samuel Morse, and Claude Shannon, and reveals how our understanding of information is transforming not only how we look at the world, but how we live. A New York Times Notable Book A Los Angeles Times and Cleveland Plain Dealer Best Book of the Year Winner of the PEN/E. O. Wilson Literary Science Writing Award

CALCULUS MADE EASY

St. Martin's Press **Calculus Made Easy** by Silvanus P. Thompson and Martin Gardner has long been the most popular calculus primer, and this major revision of the classic math text makes the subject at hand still more comprehensible to readers of all levels. With a new introduction, three new chapters, modernized language and methods throughout, and an appendix of challenging and enjoyable practice problems, **Calculus Made Easy** has been thoroughly updated for the modern reader.

MODELING LIFE

THE MATHEMATICS OF BIOLOGICAL SYSTEMS

Springer This book develops the mathematical tools essential for students in the life sciences to describe interacting systems and predict their behavior. From predator-prey populations in an ecosystem, to hormone regulation within the body, the natural world abounds in dynamical systems that affect us profoundly. Complex feedback relations and counter-intuitive responses are common in nature; this book develops the quantitative skills needed to explore these interactions. Differential equations are the natural mathematical tool for quantifying change, and are the driving force throughout this book. The use of Euler's method makes nonlinear examples tractable and accessible to a broad spectrum of early-stage undergraduates, thus providing a practical alternative to the procedural approach of a traditional Calculus curriculum. Tools are developed within numerous, relevant examples, with an emphasis on the construction, evaluation, and interpretation of mathematical models throughout. Encountering these concepts in context, students learn not only quantitative techniques, but how to bridge between biological and mathematical ways of thinking. Examples range broadly, exploring the dynamics of neurons and the immune system, through to population dynamics and the Google PageRank algorithm. Each scenario relies only on an interest in the natural world; no biological expertise is assumed of

student or instructor. Building on a single prerequisite of Precalculus, the book suits a two-quarter sequence for first or second year undergraduates, and meets the mathematical requirements of medical school entry. The later material provides opportunities for more advanced students in both mathematics and life sciences to revisit theoretical knowledge in a rich, real-world framework. In all cases, the focus is clear: how does the math help us understand the science?

COORDINATION DYNAMICS: ISSUES AND TRENDS

Springer This book brings together scientists from all over the world who have defined and developed the field of Coordination Dynamics. Grounded in the concepts of self-organization and the tools of nonlinear dynamics, appropriately extended to handle informational aspects of living things, Coordination Dynamics aims to understand the coordinated functioning of a variety of different systems at multiple levels of description. The book addresses the themes of Coordination Dynamics and Dynamic Patterns in the context of the following topics: Coordination of Brain and Behavior, Perception-Action Coupling, Control, Posture, Learning, Intention, Attention, and Cognition.

A FIRST COURSE IN DIFFERENTIAL EQUATIONS

Springer Science & Business Media

There are many excellent texts on elementary differential equations designed for the standard sophomore course. However, in spite of the fact that most courses are one semester in length, the texts have evolved into calculus-like presentations that include a large collection of methods and applications, packaged with student manuals, and Web-based notes, projects, and supplements. All of this comes in several hundred pages of text with busy formats. Most students do not have the time or desire to read voluminous texts and explore internet supplements. The format of this differential equations book is different; it is a one-semester, brief treatment of the basic ideas, models, and solution methods.

Its limited coverage places it somewhere between an outline and a detailed textbook. I have tried to write concisely, to the point, and in plain language. Many worked examples and exercises are included. A student who works through this primer will have the tools to go to the next level in applying differential equations to problems in engineering, science, and applied mathematics. It can give some instructors, who want more concise coverage, an alternative to existing texts.

THE PENDULUM

A CASE STUDY IN PHYSICS

OUP Oxford The pendulum: a case study in physics is a unique book in several ways. Firstly, it is a comprehensive quantitative study of one

physical system, the pendulum, from the viewpoint of elementary and more advanced classical physics, modern chaotic dynamics, and quantum mechanics. In addition, coupled pendulums and pendulum analogs of superconducting devices are also discussed. Secondly, this book treats the physics of the pendulum within a historical and cultural context, showing, for example, that the pendulum has been intimately connected with studies of the earth's density, the earth's motion, and timekeeping. While primarily a physics book, the work provides significant added interest through the use of relevant cultural and historical vignettes. This approach offers an alternative to the usual modern physics courses. The text is amply illustrated and augmented by exercises at the end of each chapter.

PATTERN FORMATION IN CONTINUOUS AND COUPLED SYSTEMS

A SURVEY VOLUME

Springer Science & Business Media This volume contains a number of mini-review articles authored by speakers and attendees at the IMA workshop on Pattern Formation in Continuous and Coupled Systems. Pattern formation has been studied intensively for most of this century by both experimentalists and theoreticians. This workshop focused on new directions in the patterns literature. The goals were to continue communication between these groups, and to familiarize a larger audience with some of the newer directions in the field. Systems that generate new types of pattern such as discrete coupled systems, systems with global coupling, and combustion experiments were stressed, as were new types of pattern. The mini-reviews in this volume are intended to be pointers to the current literature for researchers at all levels and therefore include extensive bibliographies. They are also intended to discuss why certain subjects are currently exciting and worthy of additional research.