

Classical Mechanics Taylor J R Solution Manual

This textbook — appropriate for a one-semester course in classical mechanics at the late undergraduate or early graduate level — presents a fresh, modern approach to mechanics. About 150 exercises, covering a wide variety of topics and applications, have solutions roughly outlined for enhanced understanding. Unique to this text is the versatile application of programming language Mathematica™ throughout to analyze systems and generate results. Coverage is also devoted to the topic on one dimensional continuum systems. The extensive discussions on inverse problems of mechanical systems and the detailed analysis of stability of classical systems certainly make this an outstanding textbook.

This book develops the understanding and skills needed to be able to tackle original control problems. The general approach to a given control problem is to try the simplest tentative solution first and, when this is insufficient, to explain why and use a more sophisticated alternative to remedy the deficiency and achieve satisfactory performance. This pattern of working gives readers a full understanding of different controllers and teaches them to make an informed choice between traditional controllers and more advanced modern alternatives in meeting the needs of a particular plant. Attention is focused on the time domain, covering model-based linear and nonlinear forms of control together with robust control based on sliding modes and the use of state observers such as disturbance estimation. Feedback Control is self-contained, paying much attention to explanations of underlying concepts, with detailed mathematical derivations being employed where necessary. Ample use is made of diagrams to aid these conceptual explanations and the subject matter is enlivened by continual use of

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examples and problems derived from real control applications. Readers' learning is further enhanced by experimenting with the fully-commented MATLAB®/Simulink® simulation environment made accessible at [insert URL here](#) to produce simulations relevant to all of the topics covered in the text. A solutions manual for use by instructors adopting the book can also be downloaded from [insert URL here](#). Feedback Control is suitable as a main textbook for graduate and final-year undergraduate courses containing control modules; knowledge of ordinary linear differential equations, Laplace transforms, transfer functions, poles and zeros, root locus and elementary frequency response analysis, and elementary feedback control is required. It is also a useful reference source on control design methods for engineers practicing in industry and for academic control researchers.

Covers both holonomic and non-holonomic constraints in a study of the mechanics of the constrained rigid body. Covers all types of general constraints applicable to the solid rigid
Performs calculations in matrix form Provides algorithms for the numerical calculations for each type of constraint Includes solved numerical examples Accompanied by a website hosting programs

Intended for advanced undergraduates and beginning graduate students, this text is based on the highly successful course given by Walter Greiner at the University of Frankfurt, Germany. The two volumes on classical mechanics provide not only a complete survey of the topic but also an enormous number of worked examples and problems to show students clearly how to apply the abstract principles to realistic problems.

This is an intuitively motivated presentation of many topics in classical mechanics and related areas of control theory and calculus of variations. All topics throughout the book are treated

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with zero tolerance for unrevealing definitions and for proofs which leave the reader in the dark. Some areas of particular interest are: an extremely short derivation of the ellipticity of planetary orbits; a statement and an explanation of the "tennis racket paradox"; a heuristic explanation (and a rigorous treatment) of the gyroscopic effect; a revealing equivalence between the dynamics of a particle and statics of a spring; a short geometrical explanation of Pontryagin's Maximum Principle, and more. In the last chapter, aimed at more advanced readers, the Hamiltonian and the momentum are compared to forces in a certain static problem. This gives a palpable physical meaning to some seemingly abstract concepts and theorems. With minimal prerequisites consisting of basic calculus and basic undergraduate physics, this book is suitable for courses from an undergraduate to a beginning graduate level, and for a mixed audience of mathematics, physics and engineering students. Much of the enjoyment of the subject lies in solving almost 200 problems in this book.

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The book discusses continuous and discrete systems in systematic and sequential approaches for all aspects of nonlinear dynamics. The unique feature of the book is its mathematical theories on flow bifurcations, oscillatory solutions, symmetry analysis of nonlinear systems and chaos theory. The logically structured content and sequential orientation provide readers with a global overview of the topic. A systematic mathematical approach has been adopted, and a number of examples worked out in detail and exercises have been included. Chapters 1–8 are devoted to continuous systems, beginning with one-dimensional flows. Symmetry is an inherent character of nonlinear systems, and the Lie invariance principle and its algorithm for finding symmetries of a system are discussed in Chap. 8. Chapters 9–13 focus on discrete

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systems, chaos and fractals. Conjugacy relationship among maps and its properties are described with proofs. Chaos theory and its connection with fractals, Hamiltonian flows and symmetries of nonlinear systems are among the main focuses of this book. Over the past few decades, there has been an unprecedented interest and advances in nonlinear systems, chaos theory and fractals, which is reflected in undergraduate and postgraduate curricula around the world. The book is useful for courses in dynamical systems and chaos, nonlinear dynamics, etc., for advanced undergraduate and postgraduate students in mathematics, physics and engineering.

A comprehensive and authoritative text on the formation and evolution of planetary atmospheres, for graduate-level students and researchers.

This book guides undergraduate students in the use of Maxima—a computer algebra system—in solving problems in classical mechanics. It functions well as a supplement to a typical classical mechanics textbook. When it comes to problems that are too difficult to solve by hand, computer algebra systems that can perform symbolic mathematical manipulations are a valuable tool. Maxima is particularly attractive in that it is open-source, multiple-platform software that students can download and install free of charge. Lessons learned and capabilities developed using Maxima are easily transferred to other, proprietary software. This is the first volume of three, devoted to Mechanics. This book contains classical mechanics problems including kinematics and statics. It is recommended as a supplementary textbook for undergraduate and graduate students from mechanical and civil engineering, as well as for physical scientists and engineers. It contains a basic introduction to classical mechanics, including fundamental principles, statics, and the geometry of masses, as well as thorough

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discussion on kinematics.

This elegant book presents a rigorous introduction to the theory of nonlinear mechanics and chaos. It turns out that many simple mechanical systems suffer from a peculiar malady. They are deterministic in the sense that their motion can be described with partial differential equations, but these equations have no proper solutions and the behavior they describe can be wildly unpredictable. This is implicit in Newtonian physics, and although it was analyzed in the pioneering work of Poincaré in the 19th century, its full significance has only been realized since the advent of modern computing. This book follows this development in the context of classical mechanics as it is usually taught in most graduate programs in physics. It starts with the seminal work of Laplace, Hamilton, and Liouville in the early 19th century and shows how their formulation of mechanics inevitably leads to systems that cannot be "solved" in the usual sense of the word. It then discusses perturbation theory which, rather than providing approximate solutions, fails catastrophically due to the problem of small denominators. It then goes on to describe chaotic motion using the tools of discrete maps and Poincaré sections. This leads to the two great landmarks of chaos theory, the Poincaré–Birkhoff theorem and the so-called KAM theorem, one of the signal results in modern mathematics. The book concludes with an appendix discussing the relevance of the KAM theorem to the ergodic hypothesis and the second law of thermodynamics. *Lectures on Nonlinear Mechanics and Chaos Theory* is written in the easy conversational style of a great teacher. It features numerous computer-drawn figures illustrating the behavior of nonlinear systems. It also contains homework exercises and a selection of more detailed computational projects. The book will be valuable to students and faculty in physics, mathematics, and engineering. See Press Release: Problems

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in mechanics open the door to the orderly world of chaos

This new edition of Classical Mechanics, aimed at undergraduate physics and engineering students, presents in a user-friendly style an authoritative approach to the complementary subjects of classical mechanics and relativity. The text starts with a careful look at Newton's Laws, before applying them in one dimension to oscillations and collisions. More advanced applications - including gravitational orbits and rigid body dynamics - are discussed after the limitations of Newton's inertial frames have been highlighted through an exposition of Einstein's Special Relativity. Examples given throughout are often unusual for an elementary text, but are made accessible to the reader through discussion and diagrams. Updates and additions for this new edition include: New vector notation in Chapter 1 An enhanced discussion of equilibria in Chapter 2 A new section on a body falling a large distance towards a gravitational source in Chapter 2 New sections in Chapter 8 on general rotation about a fixed principal axes, simple examples of principal axes and principal moments of inertia and kinetic energy of a body rotating about a fixed axis New sections in chapter 9: Foucault pendulum and free rotation of a rigid body; the latter including the famous tennis racquet theorem Enhanced chapter summaries at the end of each chapter Novel problems with numerical answers A solutions manual is available at: www.wiley.com/go/mccall

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A unique description of the phenomena that arise from the interaction between quantum systems and their environment. Because of the novel character of the approach discussed, the book addresses scientists from all fields of physics and related disciplines as well as students of physics.

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There are numerous determinants that drive and influence economic efficiency in contemporary nations. Critical insights can be gained from developing analytical models to understand the economies of the world. *Ranking Economic Performance and Efficiency in the Global Market: Emerging Research and Opportunities* is an innovative source of scholarly information that discusses world rankings of modern national economies. Including a range of topics such as geopolitics, sovereignty, and jurisdictional considerations, this book is ideally designed for academics, researchers, professionals, and students interested in the relevant knowledge that can be extracted from the determinants of economic efficiency.

This book restates odd-numbered problems from Taylor's superb CLASSICAL MECHANICS, and then provides detailed solutions.

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This book is a single-source guide to nonlinearity and nonlinear techniques in energy harvesting, with a focus on vibration energy harvesters for micro and nanoscale applications. The authors demonstrate that whereas nonlinearity was avoided as an undesirable phenomenon in early energy harvesters, now it can be used as an essential part of these systems. Readers will benefit from an overview of nonlinear techniques and applications, as well as deeper insight into methods of analysis and modeling of energy harvesters, employing different nonlinearities. The role of nonlinearity due to different aspects of an energy harvester is discussed, including nonlinearity due to mechanical-to-electrical conversion, nonlinearity due to conditioning electronic circuits, nonlinearity due to novel materials (e.g., graphene), etc. Coverage

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includes tutorial introductions to MEMS and NEMS technology, as well as a wide range of applications, such as nonlinear oscillators and transducers for energy harvesters and electronic conditioning circuits for effective energy processing.

The development of special and general relativity has relied significantly on ideas of symmetry. Similarly, modern efforts to test these theories have often sought either violations or extensions of the symmetries seen, and symmetry is regularly used a tool in seeking new applications. In this Special Issue of symmetry, we explore some contemporary research related to symmetry in special and general relativity.

Filling a gap in the literature, this book features in-depth discussions on amplitude modulation AFM, providing an overview of the theory, instrumental considerations and applications of the technique in both academia and industry. As such, it includes examples from material science, soft condensed matter, molecular biology, and biophysics, among others. The text is written in such a way as to enable readers from different backgrounds and levels of expertise to find the information suitable for their needs.

Chrology By: Ulrich Ndilira Rotam The background research for Chrology: Science of All Sciences, Unification of All Knowledge was conducted in a generalized way on several domains to understand if there is a single law that governs all sciences, all literary studies, our existence, and all our knowledge on different generalities in a single model. This research and study led Ulrich Ndilira Rotam to discover a simple and

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absolute law in its originality that governs the presence of all existence in the universe in a complex way according to the space, existence, time, and scalable factors. Not satisfied with the vision or the interpretation of the world with all our theories: big bang, strings, cosmic inflation, general relativities, quantum physics, our existence, Rotam saw that there was a lack of gigantic pieces that required a new shaping and vision, seeing in a different way all that surrounds us. He wanted to unify everything on one model. In other words, Chronology makes it possible to push the boundaries of innovations on all human disciplines, to see and understand how the whole universe appears to us in our small global world and all sciences, literatures are all united on one model with their limits... a completely new concept.

An introduction to the basic principles and methods of analytical mechanics, with selected examples of advanced topics and areas of ongoing research.

"Dwight E. Neuenschwander's introduction to the theorem's genesis, applications, and consequences artfully unpacks its universal importance and unsurpassed elegance. Drawing from over thirty years of teaching the subject, Neuenschwander uses mechanics, optics, geometry, and field theory to point the way to a deep understanding of Noether's Theorem. The three sections provide a step-by-step, simple approach to the less-complex concepts surrounding the theorem, in turn instilling the knowledge and confidence needed to grasp the full wonder it encompasses. Illustrations and worked examples throughout each chapter serve as signposts on the way to this apex of

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physics."--Publisher's description.

Thermodynamically constrained averaging theory provides a consistent method for upscaling conservation and thermodynamic equations for application in the study of porous medium systems. The method provides dynamic equations for phases, interfaces, and common curves that are closely based on insights from the entropy inequality. All larger scale variables in the equations are explicitly defined in terms of their microscale precursors, facilitating the determination of important parameters and macroscale state equations based on microscale experimental and computational analysis. The method requires that all assumptions that lead to a particular equation form be explicitly indicated, a restriction which is useful in ascertaining the range of applicability of a model as well as potential sources of error and opportunities to improve the analysis.

This book studies the dynamics of 2D objects moving through turbulent fluids. It examines the decay of turbulence over extended time scales, and compares the dynamics of non-spherical particles moving through still and turbulent fluids. The book begins with an introduction to the project, its aims, and its relevance for industrial applications. It then discusses the movement of planar particles in quiescent fluid, and presents the numerous methodologies used to measure it. The book also presents a detailed analysis of the falling style of irregular particles, which makes it possible to estimate particle trajectory and wake morphology based on frontal geometry. In turn, the book provides the results of an analysis of physically constrained decaying turbulence in a laboratory setting. These results suggest that large-scale cut-off in

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numerical simulations can result in severe bias in the computed turbulent kinetic energy for long waiting times. Combining the main text with a wealth of figures and sketches throughout, the book offers an accessible guide for all engineering students with a basic grasp of fluid mechanics, while the key findings will also be of interest to senior researchers.

Ultrasonic spectroscopy is a technique widely used in solid-state physics, materials science and geology which utilises acoustic waves to determine fundamental material properties of objects, such as their elasticity and mechanical energy dissipation. This book provides complete coverage of the main issues relevant to the design, analysis and interpretation of ultrasonic experiments. Topics including elasticity, acoustic waves in solids, ultrasonic loss and the relation of elastic constants to thermodynamic potentials are covered in depth. Modern techniques and experimental methods including resonant ultrasound spectroscopy, digital pulse-echo and picosecond ultrasound are also introduced and reviewed. Also containing extensive background theory, this self-contained book is accessible to students new to the field of ultrasonic spectroscopy, as well as to graduate students and researchers in physics, engineering, materials science and geophysics.

A comprehensive and engaging textbook, providing a graduate-level, non-historical, modern introduction of quantum mechanical concepts.

Dynamics of Classical and Quantum Fields: An Introduction focuses on dynamical fields in non-relativistic physics. Written by a physicist for physicists, the book is designed to help readers develop analytical skills related to classical and quantum fields at the non-relativistic level, and think about the concepts and theory through numerous problems. In-depth yet accessible, the book presents new and conventional topics in a self-contained manner that beginners would

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find useful. A partial list of topics covered includes: Geometrical meaning of Legendre transformation in classical mechanics Dynamical symmetries in the context of Noether's theorem The derivation of the stress energy tensor of the electromagnetic field, the expression for strain energy in elastic bodies, and the Navier Stokes equation Concepts of right and left movers in case of a Fermi gas explained Functional integration is interpreted as a limit of a sequence of ordinary integrations Path integrals for one and two quantum particles and for a fermion in presence of a filled Fermi sea Fermion and boson Fock spaces, along with operators that create and annihilate particles Coherent state path integrals Many-body topics such as Schrieffer Wolff transformation, Matsubara, and Keldysh Green functions Geometrical meaning of the vortex-vortex correlation function in a charged boson fluid Nonlocal particle-hole creation operators which diagonalize interacting many-body systems The equal mix of novel and traditional topics, use of fresh examples to illustrate conventional concepts, and large number of worked examples make this book ideal for an intensive one-semester course for beginning Ph.D. students. It is also a challenging and thought provoking book for motivated advanced undergraduates.

Reviews in Plasmonics is a comprehensive collection of current trends and emerging hot topics in the field of Plasmonics and closely related disciplines. It summarizes the years progress in Plasmonics and its applications, with authoritative analytical reviews specialized enough to be attractive to professional researchers, yet also appealing to the wider audience of scientists in related disciplines of Plasmonics.

Bridging the basics to recent research advances, this is the ideal learning and reference work for physicists studying control theory.

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Classical Mechanics Student Solutions Manual

One could make the claim that all branches of physics are basically generalizations of classical mechanics. It is also often the first course which is taught to physics students. The approach of this book is to construct an intermediate discipline between general courses of physics and analytical mechanics, using more sophisticated mathematical tools. The aim of this book is to prepare a self-consistent and compact text that is very useful for teachers as well as for independent study.

Classical Mechanics, Second Edition presents a complete account of the classical mechanics of particles and systems for physics students at the advanced undergraduate level. The book evolved from a set of lecture notes for a course on the subject taught by the author at California State University, Stanislaus, for many years. It assumes the reader has been exposed to a course in calculus and a calculus-based general physics course. However, no prior knowledge of differential equations is required. Differential equations and new mathematical methods are developed in the text as the occasion demands. The book begins by describing fundamental concepts, such as velocity and acceleration, upon which subsequent chapters build. The second edition has been updated with two new sections added to the chapter on Hamiltonian formulations, and the chapter on collisions and scattering has been rewritten. The book also contains three new chapters covering Newtonian gravity, the Hamilton-

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Jacobi theory of dynamics, and an introduction to Lagrangian and Hamiltonian formulations for continuous systems and classical fields. To help students develop more familiarity with Lagrangian and Hamiltonian formulations, these essential methods are introduced relatively early in the text. The topics discussed emphasize a modern perspective, with special note given to concepts that were instrumental in the development of modern physics, for example, the relationship between symmetries and the laws of conservation. Applications to other branches of physics are also included wherever possible. The author provides detailed mathematical manipulations, while limiting the inclusion of the more lengthy and tedious ones. Each chapter contains homework problems of varying degrees of difficulty to enhance understanding of the material in the text. This edition also contains four new appendices on D'Alembert's principle and Lagrange's equations, derivation of Hamilton's principle, Noether's theorem, and conic sections.

This book is an experimental physics textbook on classical mechanics focusing on the development of experimental skills by means of discussion of different aspects of the experimental setup and the assessment of common issues such as accuracy and graphical representation. The most important topics of an experimental physics course on mechanics are covered and the main concepts

are explored in detail. Each chapter didactically connects the experiment and the theoretical models available to explain it. Real data from the proposed experiments are presented and a clear discussion over the theoretical models is given. Special attention is also dedicated to the experimental uncertainty of measurements and graphical representation of the results. In many of the experiments, the application of video analysis is proposed and compared with traditional methods.

The three volume set LNAI 9851, LNAI 9852, and LNAI 9853 constitutes the refereed proceedings of the European Conference on Machine Learning and Knowledge Discovery in Databases, ECML PKDD 2016, held in Riva del Garda, Italy, in September 2016. The 123 full papers and 16 short papers presented were carefully reviewed and selected from a total of 460 submissions. The papers presented focus on practical and real-world studies of machine learning, knowledge discovery, data mining; innovative prototype implementations or mature systems that use machine learning techniques and knowledge discovery processes in a real setting; recent advances at the frontier of machine learning and data mining with other disciplines. Part I and Part II of the proceedings contain the full papers of the contributions presented in the scientific track and abstracts of the scientific plenary talks. Part III contains the full papers of the

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contributions presented in the industrial track, short papers describing demonstration, the nectar papers, and the abstracts of the industrial plenary talks.

This book highlights an analytical solution for the dynamics of axially symmetric rotating objects. It also presents the theory of gyroscopic effects, explaining their physics and using mathematical models of Euler's form for the motion of movable spinning objects to demonstrate these effects. The major themes and approaches are represented by the spinning disc and the action of the system of interrelated inertial torques generated by the centrifugal, common inertial, Coriolis forces, as well as the change in their angular momentum. These torques constitute the fundamental principles of the mechanical gyroscope theory that can be used for any rotating objects, like rings, cones, spheres, paraboloids and propellers of different designs. Lastly, the mathematical models for the gyroscopic effects are validated by practical tests.

An accessible guide to developing intuition and skills for solving mathematical problems in the physical sciences and engineering. Equations play a central role in problem solving across various fields of study. Understanding what an equation means is an essential step toward forming an effective strategy to solve it, and it also lays the foundation for a more successful and fulfilling work experience.

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Thinking About Equations provides an accessible guide to developing an intuitive understanding of mathematical methods and, at the same time, presents a number of practical mathematical tools for successfully solving problems that arise in engineering and the physical sciences. Equations form the basis for nearly all numerical solutions, and the authors illustrate how a firm understanding of problem solving can lead to improved strategies for computational approaches. Eight succinct chapters provide thorough topical coverage, including:

- Approximation and estimation
- Isolating important variables
- Generalization and special cases
- Dimensional analysis and scaling
- Pictorial methods and graphical solutions
- Symmetry to simplify equations

Each chapter contains a general discussion that is integrated with worked-out problems from various fields of study, including physics, engineering, applied mathematics, and physical chemistry. These examples illustrate the mathematical concepts and techniques that are frequently encountered when solving problems. To accelerate learning, the worked example problems are grouped by the equation-related concepts that they illustrate as opposed to subfields within science and mathematics, as in conventional treatments. In addition, each problem is accompanied by a comprehensive solution, explanation, and commentary, and numerous exercises at the end of each chapter provide an opportunity to

testcomprehension. Requiring only a working knowledge of basic calculus and introductory physics, *Thinking About Equations* is an excellent supplement for courses in engineering and the physical sciences at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers, practitioners, and educators in all branches of engineering, physics, chemistry, biophysics, and other related fields who encounter mathematical problems in their day-to-day work. This book deals with the rotor dynamics of automotive turbochargers while encompassing the analysis of the dynamics of rotating machines at very high rotor speeds of 300,000 rpm and above. This interdisciplinary field involves 1. thermodynamics and turbo-matching knowledge to compute working conditions of turbochargers, 2. fluid and bearing dynamics to calculate various operating thrust loads and to design the rotating floating ring bearings (two-oil-film bearings), and 3. tribology to improve the rotor stability and to reduce the bearing friction. Mathematical background in modeling and simulation methods is necessary; however, the prerequisites have been kept to a minimum. The book addresses both practitioners working in the field of rotor dynamics of automotive turbochargers and graduate students in mechanical engineering. The first quantum revolution started in the early 20th century and gave us new rules that govern physical reality. Accordingly, many devices that changed

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dramatically our lifestyle, such as transistors, medical scanners and lasers, appeared in the market. This was the origin of quantum technology, which allows us to organize and control the components of a complex system governed by the laws of quantum physics. This is in sharp contrast to conventional technology, which can only be understood within the framework of classical mechanics. We are now in the middle of a second quantum revolution. Although quantum mechanics is nowadays a mature discipline, quantum engineering as a technology is now emerging in its own right. We are about to manipulate and sense individual particles, measuring and exploiting their quantum properties. This is bringing major technical advances in many different areas, including computing, sensors, simulations, cryptography and telecommunications. The present collection of selected papers is a clear demonstration of the tremendous vitality of the field. The issue is composed of contributions from world leading researchers in quantum optics and quantum information, and presents viewpoints, both theoretical and experimental, on a variety of modern problems.

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