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Curves and Singularities Elementary Euclidean Geometry An Introduction to Geometrical Physics The Geometry of Physics Introduction to Geometry Introduction to Algebraic Geometry An Introduction to Symplectic Geometry Algebraic Geometry An Introduction to the Geometry of Numbers Geometry an Introduction Gravity, a Geometrical Course Introduction to Projective Geometry Computational Geometry Introduction to Algebraic Geometry Introduction to Tropical Geometry College Geometry An Introduction to Incidence Geometry Differential Geometry Introduction to the Geometry of N Dimensions Introduction to Geometry and Topology INTRO TO GEOMETRIC SHAPES - GE Complex Geometry Algebra & Geometry A Geometrical Picture Book Introduction to Complex Analytic Geometry Introduction to Computational Contact Mechanics An Introduction to the Geometry of Numbers An Introduction to Analytic Geometry and Calculus Geometry with an Introduction to Cosmic Topology An Introduction to Geometric Topology An Introduction to Differential Geometry Geometry for Teachers Geometric Group Theory Introduction to Lipschitz Geometry of Singularities Matroids: A Geometric Introduction The Geometry of Spacetime Introduction to Algebraic Geometry College Geometry An Introduction to Differential Geometry with Applications to Elasticity From a Geometrical Point of View

This introductory volume offers strong reinforcement for its teachings, with detailed examples and numerous theorems, proofs, and exercises, plus complete answers to all odd-numbered end-of-chapter problems. 1970 edition. Author Serge Lang defines algebraic geometry as the study of systems of algebraic equations in several variables and of the structure that one can give to the solutions of such equations. The study can be carried out in four ways: analytical, topological, algebraico-geometric, and arithmetic. This volume offers a rapid, concise, and self-contained introductory approach to the algebraic aspects of the third method, the algebraico-geometric. The treatment assumes only familiarity with elementary algebra up to the level of Galois theory. Starting with an opening chapter on the general theory of places, the author advances to examinations of algebraic varieties, the absolute theory of varieties, and products, projections, and correspondences. Subsequent chapters explore normal varieties, divisors and linear systems, differential forms, the theory of simple points, and algebraic groups, concluding with a focus on the Riemann-Roch theorem. All the theorems of a general nature related to the foundations of the theory of algebraic groups are featured. Did you know that the study of geometry will greatly help with your child's problem solving, logic and deductive reasoning skills? It has many benefits that will push your child's likelihood for academic excellence. Teach your child about the subject while he/she is still young. Start with this book today! ‘Gravity, a Geometrical Course’ presents general relativity (GR) in a systematic and exhaustive way, covering three aspects that are homogenized into a single texture: i) the mathematical, geometrical foundations, exposed in a self consistent contemporary formalism, ii) the main physical, astrophysical and cosmological applications, updated to the issues of contemporary research and observations, with glimpses on supergravity and superstring theory, iii) the historical development of scientific ideas underlying both the birth of general relativity and its subsequent evolution. The book is divided in two volumes. Volume Two is covers black holes, cosmology and an introduction to supergravity. The aim of this volume is two-fold. It completes the presentation of GR and it introduces the reader to theory of gravitation beyond GR, which is supergravity. Starting with a short history of the black hole concept, the book covers the Kruskal extension of the Schwarzschild metric, the causal structures of Lorentzian manifolds, Penrose diagrams and a detailed analysis of the Kerr-Newman metric. An extensive historical account of the development of modern cosmology is followed by a detailed presentation of its mathematical structure, including non-isotropic cosmologies and billiards, de Sitter space and inflationary scenarios, perturbation theory and anisotropies of the Cosmic Microwave Background. The last three chapters deal with the mathematical and conceptual foundations of supergravity in the frame of free differential algebras. Branes are presented both as classical solutions of the bulk theory and as world-volume gauge theories with particular emphasis on the geometrical interpretation of kappa-supersymmetry. The rich bestiary of special geometries underlying supergravity lagrangians is presented, followed by a chapter providing glances on the equally rich collection of special solutions of supergravity. Pietro Frè is Professor of Theoretical Physics at the University of Torino, Italy and is currently serving as Scientific Counsellor of the Italian Embassy in Moscow. His scientific passion lies in supergravity and all allied topics, since the inception of the field, in 1976. He was professor at SISSA, worked in the USA and at CERN. He has taught General Relativity for 15 years. He has previously two scientific monographs, “Supergravity and Superstrings” and “The N=2 Wonderland”, He is also the author of a popular science book on cosmology and two novels, in Italian. From the reviews: "A well-written, very thorough account ... Among the topics are lattices, reduction, Minkowskis Theorem, distance functions, packings, and automorphs; some applications to number theory; excellent bibliographical references." The American Mathematical Monthly Translated into many languages, this book was in continuous use as the standard university-level text for a quarter-century, until it was revised and enlarged by the author in 1952. World-renowned writer and researcher Nathan Altshiller-Court (1881–1968) was a professor of mathematics at the University of Oklahoma for more than thirty years. His revised introduction to modern geometry offers today's students the benefits of his many years of teaching experience. The first part of the text stresses construction problems, proceeding to surveys of similitude and homothecy, properties of the triangle and the quadrilateral, and harmonic division. Subsequent chapters explore the geometry of the circle — including inverse points, orthogonals, coaxals, and the problem of Apollonius and triangle geometry, focusing on Lemoine and Brocard geometry, isogonal lines, Tucker circles, and the orthopole. Numerous exercises of varying degrees of difficulty appear throughout the text. Classic exploration of topics of perennial interest to geometers: fundamental ideas of incidence, parallelism, perpendicularity, angles between linear spaces, polytopes. Examines analytical geometry from projective and analytic points of view. 1929 edition. This is the only text that introduces differential geometry by combining the following: an intuitive geometric foundation, a rigorous connection with the standard formalisms, computer exercises with Maple, and a problems-based approach. Has running theme on the intrinsic/extrinsic view of curves and surfaces. *Uses basic intuitive geometry as a starting point which makes the material more accessible and the formalism more meaningful. *Topics are based on and introduced through 55 core problems. *The ribbon test for geometrically finding geodesics is introduced in Chapter 1. Then it is proven that it works in Chapter 3. Finally, using ruled surfaces in Chapter 7, it is proven that almost all geodesics can be found this way. *Introduces hyperbolic geometry in the first chapter. *Supports an intuitive grasp of concepts. *Includes 19 computer projects for use with Maple. *An Instructor's Manual with complete solutions for each problem is available. Easily accessible Includes recent developments Assumes very little knowledge of differentiable manifolds and functional analysis Particular emphasis on topics related to mirror symmetry (SUSY, Kaehler-Einstein metrics, Tian-Todorov lemma) From a Geometrical Point of View explores historical and philosophical aspects of category theory, trying therewith to expose its significance in the mathematical landscape. The main thesis is that Klein's Erlangen program in geometry is in fact a particular instance of a general and broad phenomenon revealed by category theory. The volume starts with Eilenberg and Mac Lane's work in the early 1940's and follows the major developments of the theory from this perspective. Particular attention is paid to the philosophical elements involved in this development. The book ends with a presentation of categorical logic, some of its results and its significance in the foundations of mathematics. From a Geometrical Point of View aims to provide its readers with a conceptual perspective on category theory and categorical logic, in order to gain insight into their role and nature in contemporary mathematics. It should be of interest to mathematicians, logicians, philosophers of mathematics and science in general, historians of contemporary mathematics, physicists and computer scientists. This book provides an introduction to topology, differential topology, and differential geometry. It is based on manuscripts refined through use in a variety of lecture courses. The first chapter covers elementary results and concepts from point-set topology. An exception is the Jordan Curve Theorem, which is proved for polygonal paths and is intended to give students a first glimpse into the nature of deeper topological problems. The second chapter of the book introduces manifolds and Lie groups, and examines a wide assortment of examples. Further discussion explores tangent bundles, vector bundles, differentials, vector fields, and Lie brackets of vector fields. This discussion is deepened and expanded in the third chapter, which introduces the de Rham cohomology and the oriented integral and gives proofs of the Brouwer Fixed-Point Theorem, the Jordan-Brouwer Separation Theorem, and Stokes's integral formula. The fourth and final chapter is devoted to the fundamentals of differential geometry and traces the development of ideas from curves to submanifolds of Euclidean spaces. Along the way, the book discusses connections and curvature--the central concepts of differential geometry. The discussion culminates with the Gauß equations and the version of Gauß's theorema egregium for submanifolds of arbitrary dimension and codimension. This book is primarily aimed at advanced undergraduates in mathematics and physics and is intended as the template for a one- or two-semester bachelor's course. This book gives an introduction to the field of Incidence Geometry by discussing the basic families of point-line geometries and introducing some of the mathematical techniques that are essential for their study. The families of geometries covered in this book include among others the generalized polygons, near polygons, polar spaces, dual polar spaces and designs. Also the various relationships between these geometries are investigated. Ovals and ovoids of projective spaces are studied and some applications to particular geometries will be given. A separate chapter introduces the necessary mathematical tools and techniques from graph theory. This chapter itself can be regarded as a self-contained introduction to strongly regular and distance-regular graphs. This book is essentially self-contained, only assuming the knowledge of basic notions from (linear) algebra and projective and affine geometry. Almost all theorems are accompanied with proofs and a list of exercises with full solutions is given at the end of the book. This book is aimed at graduate students and researchers in the fields of combinatorics and incidence geometry. How do you convey to your students, colleagues and friends some of the beauty of the kind of mathematics you are obsessed with? If you are a mathematician interested in finite or topological geometry and combinatorial designs, you could start by showing them some of the (400+) pictures in the "picture book". Pictures are what this book is all about; original pictures of everybody's favorite geometries such as configurations, projective planes and spaces, circle planes, generalized polygons, mathematical biplanes and other designs which capture much of the beauty, construction principles, particularities, substructures and interconnections of these geometries. The level of the text is suitable for advanced undergraduates and graduate students. Even if you are a mathematician who just wants some interesting reading you will enjoy the author's very original and comprehensive guided tour of small finite geometries and geometries on surfaces This guided tour includes lots of sterograms of the spatial models, games and puzzles and instructions on how to construct your own pictures and build some of the spatial models yourself. This friendly introduction helps undergraduate students understand and appreciate matroid theory and its connections to geometry. Hermann Minkowski recast special relativity as essentially a new geometric structure for spacetime. This book looks at the ideas of both Einstein and Minkowski, and then introduces the theory of frames, surfaces and intrinsic geometry, developing the main implications of Einstein's general relativity theory. Geometry was considered until modern times to be a model science. To be developed more geometrico was a seal of quality for any endeavor, whether mathematical or not. In the 17th century, for example, Spinoza set up his Ethics in a more geometrico manner, to emphasize the perfection, certainty, and clarity of his pronouncements. Geometry achieved this status on the heels of Euclid's Elements, in which, for the first time, a theory was built up in an axiomatic-deductive manner. Euclid started with obvious axioms - he called them "common notions" and "postulates" -, statements whose validity raised no doubts in the reader's mind. His propositions followed deductively from those axioms, so that the truth of the axioms was passed on to the propositions by means of purely logical proofs. In this sense, Euclid's geometry consisted of "eternal truths." Given its prominence, Euclid's Elements was also used as a textbook until the 20th Century. Today geometry has lost the central importance it had during earlier centuries, but it still is an important area of mathematics, and is truly fundamental for mathematics from a variety of points of view. The "Introduction to Geometry" by Ewald tries to address some of these points of view, whose significance will be examined in what follows from a historical perspective. An Introduction to Analytic Geometry and Calculus covers the basic concepts of analytic geometry and the elementary operations of calculus. This book is composed of 14 chapters and begins with an overview of the fundamental relations of the coordinate system. The next chapters deal with the fundamentals of straight line, nonlinear equations and graphs, functions and limits, and derivatives. These topics are followed by a discussion of some applications of previously covered mathematical subjects. This text also considers the fundamentals of the integrals, trigonometric functions, exponential and logarithm functions, and methods of integration. The final chapters look into the concepts of parametric equations, polar coordinates, and infinite series. This book will prove useful to mathematicians and undergraduate and graduate mathematics students. Symplectic geometry is a central topic of current research in mathematics. Indeed, symplectic methods are key ingredients in the study of dynamical systems, differential equations, algebraic geometry, topology, mathematical physics and representations of Lie groups. This book is a true introduction to symplectic geometry, assuming only a general background in analysis and familiarity with linear algebra. It starts with the basics of the geometry of symplectic vector spaces. Then, symplectic manifolds are defined and explored. In addition to the essential classic results, such as Darboux's theorem, more recent results and ideas are also included here, such as symplectic capacity and pseudoholomorphic curves. These ideas have revolutionized the subject. The main examples of symplectic manifolds are given, including the cotangent bundle, Kähler manifolds, and coadjoint orbits. Further principal ideas are carefully examined, such as Hamiltonian vector fields, the Poisson bracket, and connections with contact manifolds. Berndt describes some of the close connections between symplectic geometry and mathematical physics in the last two chapters of the book. In particular, the moment map is defined and explored, both mathematically and in its relation to physics. He also introduces symplectic reduction, which is an important tool for reducing the number of variables in a physical system and for constructing new symplectic manifolds from old. The final chapter is on quantization, which uses symplectic methods to take classical mechanics to quantum mechanics. This section includes a discussion of the Heisenberg group and the Weil (or metaplectic) representation of the symplectic group. Several appendices provide background material on vector bundles, on cohomology, and on Lie groups and Lie algebras and their representations. Berndt's presentation of symplectic geometry is a clear and concise introduction to the major methods and applications of the subject, and requires only a minimum of prerequisites. This book would be an excellent text for a graduate course or as a source for anyone who wishes to learn about symplectic geometry. From the reviews: "This book offers a coherent treatment, at the graduate textbook level, of the field that has come to be known in the last decade or so as computational geometry. ... ... The book is well organized and lucidly written; a timely contribution by two founders of the field. It clearly demonstrates that computational geometry in the plane is now a fairly well-understood branch of computer science and mathematics. It also points the way to the solution of the more challenging problems in dimensions higher than two." #Mathematical Reviews#1 "... This remarkable book is a comprehensive and systematic study on research results obtained especially in the last ten years. The very clear presentation concentrates on basic ideas, fundamental combinatorial structures, and crucial algorithmic techniques. The plenty of results is clever organized following these guidelines and within the framework of some detailed case studies. A large number of figures and examples also aid the understanding of the material. Therefore, it can be highly recommended as an early graduate text but it should prove also to be essential to researchers and professionals in applied fields of computer-aided design, computer graphics, and robotics." #Biometrical Journal#2 This book provides a working knowledge of those parts of exterior differential forms, differential geometry, algebraic and differential topology, Lie groups, vector bundles and Chern forms that are essential for a deeper understanding of both classical and modern physics and engineering. Included are discussions of analytical and fluid dynamics, electromagnetism (in flat and curved space), thermodynamics, the Dirac operator and spinors, and gauge fields, including Yang–Mills, the Aharonov–Bohm effect, Berry phase and instanton winding numbers, quarks and quark model for mesons. Before discussing abstract notions of differential geometry, geometric intuition is developed through a rather extensive introduction to the study of surfaces in ordinary space. The book is ideal for graduate and advanced undergraduate students of physics, engineering or mathematics as a course text or for self study. This third edition includes an overview of Cartan's exterior differential forms, which previews many of the geometric concepts developed in the text. curvilinear coordinates. This treatment includes in particular a direct proof of the three-dimensional Korn inequality in curvilinear coordinates. The fourth and last chapter, which heavily relies on Chapter 2, begins by a detailed description of the nonlinear and linear equations proposed by W.T. Koiter for modeling thin elastic shells. These equations are “two-dimensional”, in the sense that they are expressed in terms of two curvilinear coordinates used for de?ning the middle surface of the shell. The existence, uniqueness, and regularity of solutions to the linear Koiter equations is then established, thanks this time to a fundamental “Korn inequality on a surface” and to an “in?nit- imal rigid displacement lemma on a surface”. This chapter also includes a brief introduction to other two-dimensional shell equations. Interestingly, notions that pertain to di?erential geometry per se,suchas covariant derivatives of tensor ?elds, are also introduced in Chapters 3 and 4, where they appear most naturally in the derivation of the basic boundary value problems of three-dimensional elasticity and shell theory. Occasionally, portions of the material covered here are adapted from - cerpts from my book “Mathematical Elasticity, Volume III: Theory of Shells”, published in 2000by North-Holland, Amsterdam; in this respect, I am indebted to Arjen Sevenster for his kind permission to rely on such excerpts. Oth- wise, the bulk of this work was substantially supported by two grants from the Research Grants Council of Hong Kong Special Administrative Region, China [Project No. 9040869, CityU 100803 and Project No. 9040966, CityU 100604]. Inspired by classical geometry, geometric group theory has in turn provided a variety of applications to geometry, topology, group theory, number theory and graph theory. This carefully written textbook provides a rigorous introduction to this rapidly evolving field whose methods have proven to be powerful tools in neighbouring fields such as geometric topology. Geometric group theory is the study of finitely generated groups via the geometry of their associated Cayley graphs. It turns out that the essence of the geometry of such groups is captured in the key notion of quasi-isometry, a large-scale version of isometry whose invariants include growth types, curvature conditions, boundary constructions, and amenability. This book covers the foundations of quasi-geometry of groups at an advanced undergraduate level. The subject is illustrated by many elementary examples, outlooks on applications, as well as an extensive collection of exercises. This book provides a self-contained introduction to the topology and geometry of surfaces and three-manifolds. The main goal is to describe Thurston's geometrisation of three-manifolds, proved by Perelman in 2002. The book is divided into three parts: the first is devoted to hyperbolic geometry, the second to surfaces, and the third to three-manifolds. It contains complete proofs of Mostow's rigidity, the thick-thin decomposition, Thurston's classification of the diffeomorphisms of surfaces (via Bonahon's geodesic currents), the prime and JSJ decomposition, the topological and geometric classification of Seifert manifolds, and Thurston's hyperbolic Dehn filling Theorem. Aimed primarily at graduate students and beginning researchers, this book provides an introduction to algebraic geometry that is particularly suitable for those with no previous contact with the subject; it assumes only the standard background of undergraduate algebra. The book starts with easily-formulated problems with non-trivial solutions and uses these problems to introduce the fundamental tools of modern algebraic geometry: dimension; singularities; sheaves; varieties; and cohomology. A range of exercises is provided for each topic discussed, and a selection of problems and exam papers are collected in an appendix to provide material for further study. This text employs vector methods to explore the classical theory of curves and surfaces. Topics include basic theory of tensor algebra, tensor calculus, calculus of differential forms, and elements of Riemannian geometry. 1959 edition. This book, first published in 2004, is an example based and self contained introduction to Euclidean geometry with numerous examples and exercises. This book focuses on the unifying power of the geometrical language in bringing together concepts from many different areas of physics, ranging from classical physics to the theories describing the four fundamental interactions of Nature -- gravitational, electromagnetic, strong nuclear, and weak nuclear. The book provides in a single volume a thorough introduction to topology and differential geometry, as well as many applications to both mathematical and physical problems. It is aimed as an elementary text and is intended for first year graduate students. In addition to the traditional contents of books on special and general relativities, this book discusses also some recent advances such as de Sitter invariant special relativity, teleparallel gravity and their implications in cosmology for those wishing to reach a higher level of understanding. facts. An elementary acquaintance with topology, algebra, and analysis (in cluding the notion of a manifold) is sufficient as far as the understanding of this book is concerned. All the necessary properties and theorems have been gathered in the preliminary chapters -either with proofs or with references to standard and elementary textbooks. The first chapter of the book is devoted to a study of the rings Oa of holomorphic functions. The notions of analytic sets and germs are introduced in the second chapter. Its aim is to present elementary properties of these objects, also in connection with ideals of the rings Oa. The case of principal germs (§5) and one-dimensional germs (Puiseux theorem, §6) are treated separately. The main step towards understanding of the local structure of analytic sets is Ruckert's descriptive lemma proved in Chapter III. Among its conse quences is the important Hilbert Nullstellensatz (§4). In the fourth chapter, a study of local structure (normal triples, § 1) is followed by an exposition of the basic properties of analytic sets. The latter includes theorems on the set of singular points, irreducibility, and decom position into irreducible branches (§2). The role played by the ring 0 A of an analytic germ is shown (§4). Then, the Remmert-Stein theorem on re movable singularities is proved (§6). The last part of the chapter deals with analytically constructible sets (§7). This book presents a readable and accessible introductory course in algebraic geometry, with most of the fundamental classical results presented with complete proofs. An emphasis is placed on developing connections between geometric and algebraic aspects of the theory. Differences between the theory in characteristic and positive characteristic are emphasized. The basic tools of classical and modern algebraic geometry are introduced, including varieties, schemes, singularities, sheaves, sheaf cohomology, and intersection theory. Basic classical results on curves and surfaces are proved. More advanced topics such as ramification theory, Zariski's main theorem, and Bertini's theorems for general linear systems are presented, with proofs, in the final chapters. With more than 200 exercises, the book is an excellent resource for teaching and learning introductory algebraic geometry. Algebra & Geometry: An Introduction to University Mathematics provides a bridge between high school and undergraduate mathematics courses on algebra and geometry. The author shows students how mathematics is more than a collection of methods by presenting important ideas and their historical origins throughout the text. He incorporates a hands-on approach to proofs and connects algebra and geometry to various applications. The text focuses on linear equations, polynomial equations, and quadratic forms. The first several chapters cover foundational topics, including the importance of proofs and properties commonly encountered when studying algebra. The remaining chapters form the mathematical core of the book. These chapters explain the solution of different kinds of algebraic equations, the nature of the solutions, and the interplay between geometry and algebra The standard university-level text for decades, this volume offers exercises in construction problems, harmonic division, circle and triangle geometry, and other areas. 1952 edition, revised and enlarged by the author. This book presents a broad overview of the important recent progress which led to the emergence of new ideas in Lipschitz geometry and singularities, and started to build bridges to several major areas of singularity theory. Providing all the necessary background in a series of introductory lectures, it also contains Pham and Teissier's previously unpublished pioneering work on the Lipschitz classification of germs of plane complex algebraic curves. While a real or complex algebraic variety is topologically locally conical, it is in general not metrically conical; there are parts of its link with non-trivial topology which shrink faster than linearly when approaching the special point. The essence of the Lipschitz geometry of singularities is captured by the problem of building classifications of the germs up to local bi-Lipschitz homeomorphism. The Lipschitz geometry of a singular space germ is then its equivalence class in this category. The book is aimed at graduate students and researchers from other fields of geometry who are interested in studying the multiple open questions offered by this new subject. The content of Geometry with an Introduction to Cosmic Topology is motivated by questions that have ignited the imagination of stargazers since antiquity. What is the shape of the universe? Does the universe have and edge? Is it infinitely big? Dr. Hitchman aims to clarify this fascinating area of mathematics. This non-Euclidean geometry text is organized intothree natural parts. Chapter 1 provides an overview including a brief history of Geometry, Surfaces, and reasons to study Non-Euclidean Geometry. Chapters 2-7 contain the core mathematical content of the text, following the ErlangenProgram, which develops geometry in terms of a space and a group of transformations on that space. Finally chapters 1 and 8 introduce (chapter 1) and explore (chapter 8) the topic of cosmic topology through the geometry learned in the preceding chapters. From the reviews: "A well-written, very thorough account ... Among the topics are lattices, reduction, Minkowskis Theorem, distance functions, packings, and automorphs; some applications to number theory; excellent bibliographical references." The American Mathematical Monthly This second edition is an invaluable textbook for anyone who would like an introduction to the modern theories of catastrophies and singularities. Introduction to Computational Contact Mechanics: A Geometrical Approach covers the fundamentals of computational contact mechanics and focuses on its practical implementation. Part one of this textbook focuses on the underlying theory and covers essential information about differential geometry and mathematical methods which are necessary to build the computational algorithm independently from other courses in mechanics. The geometrically exact theory for the computational contact mechanics is described in step-by-step manner, using examples of strict derivation from a mathematical point of view. The final goal of the theory is to construct in the independent approximation form /so-called covariant form, including application to high-order and isogeometric finite elements. The second part of a book is a practical guide for programming of contact elements and is written in such a way that makes it easy for a programmer to implement using any programming language. All programming examples are accompanied by a set of verification examples allowing the user to learn the research verification technique, essential for the computational contact analysis. Key features: Covers the fundamentals of computational contact mechanics Covers practical programming, verification and analysis of contact problems Presents the geometrically exact theory for computational contact mechanics Describes algorithms used in well-known finite element software packages Describes modeling of forces as an inverse contact algorithm Includes practical exercises Contains unique verification examples such as the generalized Euler formula for a rope on a surface, and the impact problem and verification of thå percussion center Accompanied by a website hosting software Introduction to Computational Contact Mechanics: A Geometrical Approach is an ideal textbook for graduates and senior undergraduates, and is also a useful reference for researchers and practitioners working in computational mechanics. Tropical geometry is a combinatorial shadow of algebraic geometry, offering new polyhedral tools to compute invariants of algebraic varieties. It is based on tropical algebra, where the sum of two numbers is their minimum and the product is their sum. This turns polynomials into piecewise-linear functions, and their zero sets into polyhedral complexes. These tropical varieties retain a surprising amount of information about their classical counterparts. Tropical geometry is a young subject that has undergone a rapid development since the beginning of the 21st century. While establishing itself as an area in its own right, deep connections have been made to many branches of pure and applied mathematics. This book offers a self-contained introduction to tropical geometry, suitable as a course text for beginning graduate students. Proofs are provided for the main results, such as the Fundamental Theorem and the Structure Theorem. Numerous examples and explicit computations illustrate the main concepts. Each of the six chapters concludes with problems that will help the readers to practice their tropical skills, and to gain access to the research literature. This wonderful book will appeal to students and researchers of all stripes: it begins at an undergraduate level and ends with deep connections to toric varieties, compactifications, and degenerations. In between, the authors provide the first complete proofs in book form of many fundamental results in the subject. The pages are sprinkled with illuminating examples, applications, and exercises, and the writing is lucid and meticulous throughout. It is that rare kind of book which will be used equally as an introductory text by students and as a reference for experts. —Matt Baker, Georgia Institute of Technology Tropical geometry is an exciting new field, which requires tools from various parts of mathematics and has connections with many areas. A short definition is given by Maclagan and Sturmfels: “Tropical geometry is a marriage between algebraic and polyhedral geometry”. This wonderful book is a pleasant and rewarding journey through different landscapes, inviting the readers from a day at a beach to the hills of modern algebraic geometry. The authors present building blocks, examples and exercises as well as recent results in tropical geometry, with ingredients from algebra, combinatorics, symbolic computation, polyhedral geometry and algebraic geometry. The volume will appeal both to beginning graduate students willing to enter the field and to researchers, including experts. —Alicia Dickenstein, University of Buenos Aires, Argentina Rapid, concise, self-contained introduction assumes only familiarity with elementary algebra. Subjects include algebraic varieties; products, projections, and correspondences; normal varieties; differential forms; theory of simple points; algebraic groups; more. 1958 edition.

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