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Analytic Hyperbolic Geometry and Albert Einstein's Special Theory of Relativity - Abraham A. Ungar 2008
This book presents a powerful way to study Einstein's special theory of relativity and its underlying hyperbolic geometry in which analogies with classical results form the right tool. It introduces the notion of vectors into analytic hyperbolic geometry, where they are called gyrovectors. Newtonian velocity addition is the common vector addition, which is both commutative and associative. The resulting vector spaces, in turn, form the algebraic setting for the standard model of Euclidean geometry. In full analogy, Einsteinian velocity addition is a gyrovector addition, which is both gyrocommutative and gyroassociative. The resulting gyrovector spaces, in turn, form the algebraic setting for the Beltrami-Klein ball model of the hyperbolic geometry of Bolyai and Lobachevsky. Similarly, Möbius addition gives rise to gyrovector spaces that form the algebraic setting for the Poincaré ball model of hyperbolic geometry. In full analogy with classical results, the book presents a novel relativistic interpretation of stellar aberration in terms of relativistic gyrotrigonometry and gyrovector addition. Furthermore, the book presents, for the first time, the relativistic center of mass of an isolated system of noninteracting particles that coincided at some initial time $t = 0$. The novel relativistic resultant mass of the system, concentrated at the relativistic center of mass, dictates the validity of the dark matter and the dark energy that were introduced by cosmologists as ad hoc postulates to explain cosmological observations about missing gravitational force and late-time cosmic accelerated expansion. The discovery of the relativistic center of mass in this book thus demonstrates once again the usefulness of the study of Einstein's special theory of relativity in terms of its underlying analytic hyperbolic geometry.

Thinking Geometrically - Thomas Q. Sibley 2015-08-14

Thinking Geometrically: A Survey of Geometries is a well written and comprehensive survey of college geometry that would serve a wide variety of courses for both mathematics majors and mathematics education majors. Great care and attention is spent on developing visual insights and geometric intuition while stressing the logical structure, historical development, and deep interconnectedness of the ideas. Students with less mathematical preparation than upper-division mathematics majors can successfully study the topics needed for the preparation of high school teachers. There is a multitude of exercises and projects in those chapters developing all aspects of geometric thinking for these students as well as for more advanced students. These chapters include Euclidean Geometry, Axiomatic Systems and Models, Analytic Geometry, Transformational Geometry, and Symmetry. Topics in the other chapters, including Non-Euclidean Geometry, Projective Geometry, Finite Geometry, Differential Geometry, and Discrete Geometry, provide a broader view of geometry. The different chapters are as independent as possible, while the text still manages to highlight the many connections between topics. The text is self-contained, including appendices with the material in Euclid's first book and a high school axiomatic system as well as Hilbert's axioms. Appendices give brief summaries of the parts of linear algebra and multivariable calculus needed for certain chapters. While some chapters use the language of groups, no prior experience with abstract algebra is presumed. The text will support an approach emphasizing dynamical geometry software without being tied to any particular software.

A New Approach to Differential Geometry using Clifford's Geometric Algebra - John Snugg

2011-12-08

Differential geometry is the study of the curvature and calculus of curves and surfaces. A New Approach to Differential Geometry using Clifford's Geometric Algebra simplifies the discussion to an accessible level of differential geometry by introducing Clifford algebra. This presentation is relevant because Clifford algebra is an effective tool for dealing with the rotations intrinsic to the study of curved space. Complete with chapter-by-chapter exercises, an overview of general relativity, and brief biographies of historical figures, this comprehensive textbook presents a valuable introduction to differential geometry. It will serve as a useful resource for upper-level undergraduates, beginning-level graduate students, and researchers in the algebra and physics communities.

Elementary Differential Geometry - A.N. Pressley 2010-03-10

Elementary Differential Geometry presents the main results in the differential geometry of curves and surfaces suitable for a first course on the subject. Prerequisites are kept to an absolute minimum - nothing beyond first courses in linear algebra and multivariable calculus - and the most direct and straightforward approach is used throughout. New features of this revised and expanded second edition include: a chapter on non-Euclidean geometry, a subject that is of great importance in the history of mathematics and crucial in many modern developments. The main results can be reached easily and quickly by making use of the results and techniques developed earlier in the book. Coverage of topics such as: parallel transport and its applications; map colouring; holonomy and Gaussian curvature. Around 200 additional exercises, and a full solutions manual for instructors, available via www.springer.com

All the Math You Missed - Thomas A. Garrity 2021-07

Fill in any gaps in your knowledge with this overview of key topics in undergraduate mathematics, now with four new chapters.

Analytic Hyperbolic Geometry in N Dimensions - Abraham Albert Ungar 2014-12-17

The concept of the Euclidean simplex is important in the study of n-dimensional Euclidean geometry. This book introduces for the first time the concept of hyperbolic simplex as an important concept in n-dimensional hyperbolic geometry. Following the emergence of his gyroalgebra in 1988, the author crafted gyrolanguage, the algebraic language that sheds natural light on hyperbolic geometry and special relativity. Several authors have successfully employed the author's gyroalgebra in their exploration for novel results. Françoise Chatelin noted in her book, and elsewhere, that the computation language of Einstein described in this book plays a universal computational role, which extends far beyond the domain of special relativity. This book will encourage researchers to use the author's novel techniques to formulate their own results. The book provides new mathematical tools, such as hyperbolic simplexes, for the study of hyperbolic geometry in n dimensions. It also presents a new look at Einstein's special relativity theory.

Topology from the Differentiable Viewpoint - John Milnor 1997-12-14

This elegant book by distinguished mathematician John Milnor, provides a clear and succinct introduction to one of the most important subjects in modern mathematics. Beginning with basic concepts such as diffeomorphisms and smooth manifolds, he goes on to examine tangent spaces, oriented manifolds, and vector fields. Key concepts such as homotopy, the index number of a map, and the Pontryagin construction

are discussed. The author presents proofs of Sard's theorem and the Hopf theorem.

The Many Faces of Elastica - Ivailo M. Mladenov 2017-08-18

This book provides an introduction to the mathematical aspects of Euler's elastic theory and its application. The approach is rigorous, as well as visually depicted, and can be easily digested. The first few chapters introduce the needed mathematical concepts from geometry and variational calculus. The formal definitions and proofs are always illustrated through complete derivations and concrete examples. In this way, the reader becomes acquainted with Cassinian ovals, Sturmian spirals, co-Lemniscates, the nodary and the undulary, Delaunay surfaces, and their generalizations. The remaining chapters discuss the modeling of membranes, mylar balloons, rotating liquid drops, Hele-Shaw cells, nerve fibers, Cole's experiments, and membrane fusion. The book is geared towards applied mathematicians, physicists and engineers interested in Elastica Theory and its applications.

Beyond Pseudo-Rotations in Pseudo-Euclidean Spaces - Abraham Ungar 2018-01-10

Beyond Pseudo-Rotations in Pseudo-Euclidean Spaces presents for the first time a unified study of the Lorentz transformation group $SO(m, n)$ of signature (m, n) , $m, n \in \mathbb{N}$, which is fully analogous to the Lorentz group $SO(1, 3)$ of Einstein's special theory of relativity. It is based on a novel parametric realization of pseudo-rotations by a vector-like parameter with two orientation parameters. The book is of interest to specialized researchers in the areas of algebra, geometry and mathematical physics, containing new results that suggest further exploration in these areas. Introduces the study of generalized gyrogroups and gyrovector spaces Develops new algebraic structures, bi-gyrogroups and bi-gyrovector spaces Helps readers to surmount boundaries between algebra, geometry and physics Assists readers to parametrize and describe the full set of generalized Lorentz transformations in a geometric way Generalizes approaches from gyrogroups and gyrovector spaces to bi-gyrogroups and bi-gyrovector spaces with geometric entanglement

Using the Mathematics Literature - Kristine K. Fowler 2004-05-25

This reference serves as a reader-friendly guide to every basic tool and skill required in the mathematical library and helps mathematicians find resources in any format in the mathematics literature. It lists a wide range of standard texts, journals, review articles, newsgroups, and Internet and database tools for every major subfield in mathemati

Modern Differential Geometry of Curves and Surfaces with Mathematica, Second Edition - mary Gray 1997-12-29

The Second Edition combines a traditional approach with the symbolic manipulation abilities of Mathematica to explain and develop the classical theory of curves and surfaces. You will learn to reproduce and study interesting curves and surfaces - many more than are included in typical texts - using computer methods. By plotting geometric objects and studying the printed result, teachers and students can understand concepts geometrically and see the effect of changes in parameters. Modern Differential Geometry of Curves and Surfaces with Mathematica explains how to define and compute standard geometric functions, for example the curvature of curves, and presents a dialect of Mathematica for constructing new curves and surfaces from old. The book also explores how to apply techniques from analysis. Although the book makes extensive use of Mathematica, readers without access to that program can perform the calculations in the text by hand. While single- and multi-variable calculus, some linear algebra, and a few concepts of point set topology are needed to understand the theory, no computer or Mathematica skills are required to understand the concepts presented in the text. In fact, it serves as an excellent introduction to Mathematica, and includes fully documented programs written for use with Mathematica. Ideal for both classroom use and self-study, Modern Differential Geometry of Curves and Surfaces with Mathematica has been tested extensively in the classroom and used in professional short courses throughout the world.

Aspects topologiques de la physique en basse dimension. Topological aspects of low dimensional systems - A. Comtet 2000-01-20

Session LXIX. 7 - 31 July 1998

The Geometry of Total Curvature on Complete Open Surfaces - Katsuhiko Shiohama 2003-11-13

This is a self-contained account of how some modern ideas in differential geometry can be used to tackle

and extend classical results in integral geometry. The authors investigate the influence of total curvature on the metric structure of complete, non-compact Riemannian 2-manifolds, though their work, much of which has never appeared in book form before, can be extended to more general spaces. Many classical results are introduced and then extended by the authors. The compactification of complete open surfaces is discussed, as are Busemann functions for rays. Open problems are provided in each chapter, and the text is richly illustrated with figures designed to help the reader understand the subject matter and get intuitive ideas about the subject. The treatment is self-contained, assuming only a basic knowledge of manifold theory, so is suitable for graduate students and non-specialists who seek an introduction to this modern area of differential geometry.

Differential Geometry - Viktor Vasil'evich Prasolov 2022

This book combines the classical and contemporary approaches to differential geometry. An introduction to the Riemannian geometry of manifolds is preceded by a detailed discussion of properties of curves and surfaces. The chapter on the differential geometry of plane curves considers local and global properties of curves, evolutes and involutes, and affine and projective differential geometry. Various approaches to Gaussian curvature for surfaces are discussed. The curvature tensor, conjugate points, and the Laplace-Beltrami operator are first considered in detail for two-dimensional surfaces, which facilitates studying them in the many-dimensional case. A separate chapter is devoted to the differential geometry of Lie groups.

Differential Geometry of Manifolds - Stephen Lovett 2019-12-16

Differential Geometry of Manifolds, Second Edition presents the extension of differential geometry from curves and surfaces to manifolds in general. The book provides a broad introduction to the field of differentiable and Riemannian manifolds, tying together classical and modern formulations. It introduces manifolds in a both streamlined and mathematically rigorous way while keeping a view toward applications, particularly in physics. The author takes a practical approach, containing extensive exercises and focusing on applications, including the Hamiltonian formulations of mechanics, electromagnetism, string theory. The Second Edition of this successful textbook offers several notable points of revision. New to the Second Edition: New problems have been added and the level of challenge has been changed to the exercises Each section corresponds to a 60-minute lecture period, making it more user-friendly for lecturers Includes new sections which provide more comprehensive coverage of topics Features a new chapter on Multilinear Algebra

From Calculus to Cohomology - Ib H. Madsen 1997-03-13

An introductory textbook on cohomology and curvature with emphasis on applications.

Modern Differential Geometry of Curves and Surfaces with Mathematica, Third Edition - Elsa Abbena 2006-06-21

Presenting theory while using Mathematica in a complementary way, Modern Differential Geometry of Curves and Surfaces with Mathematica, the third edition of Alfred Gray's famous textbook, covers how to define and compute standard geometric functions using Mathematica for constructing new curves and surfaces from existing ones. Since Gray's death, authors Abbena and Salamon have stepped in to bring the book up to date. While maintaining Gray's intuitive approach, they reorganized the material to provide a clearer division between the text and the Mathematica code and added a Mathematica notebook as an appendix to each chapter. They also address important new topics, such as quaternions. The approach of this book is at times more computational than is usual for a book on the subject. For example, Brioshi's formula for the Gaussian curvature in terms of the first fundamental form can be too complicated for use in hand calculations, but Mathematica handles it easily, either through computations or through graphing curvature. Another part of Mathematica that can be used effectively in differential geometry is its special function library, where nonstandard spaces of constant curvature can be defined in terms of elliptic functions and then plotted. Using the techniques described in this book, readers will understand concepts geometrically, plotting curves and surfaces on a monitor and then printing them. Containing more than 300 illustrations, the book demonstrates how to use Mathematica to plot many interesting curves and surfaces. Including as many topics of the classical differential geometry and surfaces as possible, it highlights important theorems with many examples. It includes 300 miniprograms for computing and plotting various

geometric objects, alleviating the drudgery of computing things such as the curvature and torsion of a curve in space.

Essays in Mathematics and its Applications - Panos M. Pardalos 2012-08-07

The volume is dedicated to Stephen Smale on the occasion of his 80th birthday. Besides his startling 1960 result of the proof of the Poincaré conjecture for all dimensions greater than or equal to five, Smale's ground breaking contributions in various fields in Mathematics have marked the second part of the 20th century and beyond. Stephen Smale has done pioneering work in differential topology, global analysis, dynamical systems, nonlinear functional analysis, numerical analysis, theory of computation and machine learning as well as applications in the physical and biological sciences and economics. In sum, Stephen Smale has manifestly broken the barriers among the different fields of mathematics and dispelled some remaining prejudices. He is indeed a universal mathematician. Smale has been honored with several prizes and honorary degrees including, among others, the Fields Medal (1966), The Veblen Prize (1966), the National Medal of Science (1996) and the Wolf Prize (2006/2007).

A First Course in Topology - John McCleary 2006

How many dimensions does our universe require for a comprehensive physical description? In 1905, Poincaré argued philosophically about the necessity of the three familiar dimensions, while recent research is based on 11 dimensions or even 23 dimensions. The notion of dimension itself presented a basic problem to the pioneers of topology. Cantor asked if dimension was a topological feature of Euclidean space. To answer this question, some important topological ideas were introduced by Brouwer, giving shape to a subject whose development dominated the twentieth century. The basic notions in topology are varied and a comprehensive grounding in point-set topology, the definition and use of the fundamental group, and the beginnings of homology theory requires considerable time. The goal of this book is a focused introduction through these classical topics, aiming throughout at the classical result of the Invariance of Dimension. This text is based on the author's course given at Vassar College and is intended for advanced undergraduate students. It is suitable for a semester-long course on topology for students who have studied real analysis and linear algebra. It is also a good choice for a capstone course, senior seminar, or independent study.

All the Mathematics You Missed - Thomas A. Garrity 2004

Actions of Groups - John McCleary 2022-12-31

An undergraduate text with an active learning approach introducing representation theory and Galois theory topics using group actions.

Analytic Hyperbolic Geometry - Abraham A. Ungar 2005

This is the first book on analytic hyperbolic geometry, fully analogous to analytic Euclidean geometry. Analytic hyperbolic geometry regulates relativistic mechanics just as analytic Euclidean geometry regulates classical mechanics. The book presents a novel gyrovector space approach to analytic hyperbolic geometry, fully analogous to the well-known vector space approach to Euclidean geometry. A gyrovector is a hyperbolic vector. In the resulting "gyrolanguage" of the book, one attaches the prefix "gyro" to a classical term to mean the analogous term in hyperbolic geometry. The book begins with the definition of gyrogroups, which is fully analogous to the definition of groups. Gyrogroups, both gyrocommutative and nongyrocommutative, abound in group theory. Surprisingly, the seemingly structureless Einstein velocity addition of special relativity turns out to be a gyrocommutative gyrogroup operation. Introducing scalar multiplication, some gyrocommutative gyrogroups of gyrovectors become gyrovector spaces. The latter, in turn, form the setting for analytic hyperbolic geometry just as vector spaces form the setting for analytic Euclidean geometry. By hybrid techniques of differential geometry and gyrovector spaces, it is shown that Einstein (Möbius) gyrovector spaces form the setting for Beltrami-Klein (Poincaré) ball models of hyperbolic geometry. Finally, novel applications of Möbius gyrovector spaces in quantum computation, and of Einstein gyrovector spaces in special relativity, are presented.

Images of Mathematics Viewed Through Number, Algebra, and Geometry - Robert G. Bill 2014-07-31

Mathematics is often seen only as a tool for science, engineering, and other quantitative disciplines. Lost in the focus on the tools are the intricate interconnecting patterns of logic and ingenious methods of

representation discovered over millennia which form the broader themes of the subject. This book, building from the basics of numbers, algebra, and geometry provides sufficient background to make these themes accessible to those not specializing in mathematics. The various topics are also covered within the historical context of their development and include such great innovators as Euclid, Descartes, Newton, Cauchy, Gauss, Lobachevsky, Riemann, Cantor, and Gödel, whose contributions would shape the directions that mathematics would take. The detailed explanations of all subject matter along with extensive references are provided with the goal of allowing readers an entrée to a lifetime of the unique pleasures of mathematics. Topics include the axiomatic development of number systems and their algebraic rules, the role of infinity in the real and transfinite numbers, logic, and the axiomatic path from traditional to non-Euclidean geometries. The themes of algebra and geometry are then brought together through the concepts of analytic geometry and functions. With this background, more advanced topics are introduced: sequences, vectors, tensors, matrices, calculus, set theory, and topology. Drawing the common themes of this book together, the final chapter discusses the struggle over the meaning of mathematics in the twentieth century and provides a meditation on its success

Differential Geometry of Curves and Surfaces - Kristopher Tapp 2016-09-30

This is a textbook on differential geometry well-suited to a variety of courses on this topic. For readers seeking an elementary text, the prerequisites are minimal and include plenty of examples and intermediate steps within proofs, while providing an invitation to more excursive applications and advanced topics. For readers bound for graduate school in math or physics, this is a clear, concise, rigorous development of the topic including the deep global theorems. For the benefit of all readers, the author employs various techniques to render the difficult abstract ideas herein more understandable and engaging. Over 300 color illustrations bring the mathematics to life, instantly clarifying concepts in ways that grayscale could not. Green-boxed definitions and purple-boxed theorems help to visually organize the mathematical content. Color is even used within the text to highlight logical relationships. Applications abound! The study of conformal and equiareal functions is grounded in its application to cartography. Evolutes, involutes and cycloids are introduced through Christiaan Huygens' fascinating story: in attempting to solve the famous longitude problem with a mathematically-improved pendulum clock, he invented mathematics that would later be applied to optics and gears. Clairaut's Theorem is presented as a conservation law for angular momentum. Green's Theorem makes possible a drafting tool called a planimeter. Foucault's Pendulum helps one visualize a parallel vector field along a latitude of the earth. Even better, a south-pointing chariot helps one visualize a parallel vector field along any curve in any surface. In truth, the most profound application of differential geometry is to modern physics, which is beyond the scope of this book. The GPS in any car wouldn't work without general relativity, formalized through the language of differential geometry. Throughout this book, applications, metaphors and visualizations are tools that motivate and clarify the rigorous mathematical content, but never replace it.

Exploring Curvature - James Casey 2012-12-06

This introductory book is organized around a collection of simple experiments which the reader can perform at home or in a classroom setting. Methods for physically exploring the intrinsic geometry of commonplace curved objects (such as bowls, balls and watermelons) are described. The concepts of Gaussian curvature, parallel transport, and geodesics are treated.

Collected Papers - Florentin Smarandache 2014-10-14

This volume includes 37 papers of mathematics or applied mathematics written by the author alone or in collaboration. They were written during the years 2010-2014, about the hyperbolic Menelaus theorem in the Poincaré disc of hyperbolic geometry, and the Menelaus theorem for quadrilaterals in hyperbolic geometry, about some properties of the harmonic quadrilateral related to triangle simedians and to Apollonius circles, etc.

Geometric Methods in Signal and Image Analysis - Hamid Krim 2015-06-18

A comprehensive guide to modern geometric methods for signal and image analysis, from basic principles to state-of-the-art concepts and applications.

Actions of Groups - John McCleary 2022-12-31

Using the unifying notion of group actions, this second course in modern algebra introduces the deeper

algebraic tools needed to get into topics only hinted at in a first course, like the successful classification of finite simple groups and how groups play a role in the solutions of polynomial equations. Because groups may act as permutations of a set, as linear transformations on a vector space, or as automorphisms of a field, the deeper structure of a group may emerge from these viewpoints, two different groups can be distinguished, or a polynomial equation can be shown to be solvable by radicals. By developing the properties of these group actions, readers encounter essential algebra topics like the Sylow theorems and their applications, Galois theory, and representation theory. Warmup chapters that review and build on the first course and active learning modules help students transition to a deeper understanding of ideas.

Elementary Differential Geometry - A.N. Pressley 2013-11-11

Pressley assumes the reader knows the main results of multivariate calculus and concentrates on the theory of the study of surfaces. Used for courses on surface geometry, it includes interesting and in-depth examples and goes into the subject in great detail and vigour. The book will cover three-dimensional Euclidean space only, and takes the whole book to cover the material and treat it as a subject in its own right.

Algorithmic Foundation of Robotics VII - Srinivas Akella 2008-08-27

Algorithms are a fundamental component of robotic systems: they control or reason about motion and perception in the physical world. They receive input from noisy sensors, consider geometric and physical constraints, and operate on the world through imprecise actuators. The design and analysis of robot algorithms therefore raises a unique combination of questions in control theory, computational and differential geometry, and computer science. This book contains the proceedings from the 2006 Workshop on the Algorithmic Foundations of Robotics. This biannual workshop is a highly selective meeting of leading researchers in the field of algorithmic issues related to robotics. The 32 papers in this book span a wide variety of topics: from fundamental motion planning algorithms to applications in medicine and biology, but they have in common a foundation in the algorithmic problems of robotic systems.

Hyperbolic Triangle Centers - A.A. Ungar 2010-06-18

After A. Ungar had introduced vector algebra and Cartesian coordinates into hyperbolic geometry in his earlier books, along with novel applications in Einstein's special theory of relativity, the purpose of his new book is to introduce hyperbolic barycentric coordinates, another important concept to embed Euclidean geometry into hyperbolic geometry. It will be demonstrated that, in full analogy to classical mechanics where barycentric coordinates are related to the Newtonian mass, barycentric coordinates are related to the Einsteinian relativistic mass in hyperbolic geometry. Contrary to general belief, Einstein's relativistic mass hence meshes up extraordinarily well with Minkowski's four-vector formalism of special relativity. In Euclidean geometry, barycentric coordinates can be used to determine various triangle centers. While there are many known Euclidean triangle centers, only few hyperbolic triangle centers are known, and none of the known hyperbolic triangle centers has been determined analytically with respect to its hyperbolic triangle vertices. In his recent research, the author set the ground for investigating hyperbolic triangle centers via hyperbolic barycentric coordinates, and one of the purposes of this book is to initiate a study of hyperbolic triangle centers in full analogy with the rich study of Euclidean triangle centers. Owing to its novelty, the book is aimed at a large audience: it can be enjoyed equally by upper-level undergraduates, graduate students, researchers and academics in geometry, abstract algebra, theoretical physics and astronomy. For a fruitful reading of this book, familiarity with Euclidean geometry is assumed. Mathematical-physicists and theoretical physicists are likely to enjoy the study of Einstein's special relativity in terms of its underlying hyperbolic geometry. Geometers may enjoy the hunt for new hyperbolic triangle centers and, finally, astronomers may use hyperbolic barycentric coordinates in the velocity space of cosmology.

Introduction to Topology and Geometry - Saul Stahl 2014-08-21

An easily accessible introduction to over three centuries of innovations in geometry Praise for the First Edition ". . . a welcome alternative to compartmentalized treatments bound to the old thinking. This clearly written, well-illustrated book supplies sufficient background to be self-contained." —CHOICE This fully revised new edition offers the most comprehensive coverage of modern geometry currently available at an introductory level. The book strikes a welcome balance between academic rigor and accessibility, providing a complete and cohesive picture of the science with an unparalleled range of topics. Illustrating modern

mathematical topics, Introduction to Topology and Geometry, Second Edition discusses introductory topology, algebraic topology, knot theory, the geometry of surfaces, Riemann geometries, fundamental groups, and differential geometry, which opens the doors to a wealth of applications. With its logical, yet flexible, organization, the Second Edition: • Explores historical notes interspersed throughout the exposition to provide readers with a feel for how the mathematical disciplines and theorems came into being • Provides exercises ranging from routine to challenging, allowing readers at varying levels of study to master the concepts and methods • Bridges seemingly disparate topics by creating thoughtful and logical connections • Contains coverage on the elements of polytope theory, which acquaints readers with an exposition of modern theory Introduction to Topology and Geometry, Second Edition is an excellent introductory text for topology and geometry courses at the upper-undergraduate level. In addition, the book serves as an ideal reference for professionals interested in gaining a deeper understanding of the topic.

A First Course in Differential Geometry - Lyndon Woodward 2019

With detailed explanations and numerous examples, this textbook covers the differential geometry of surfaces in Euclidean space.

Elementary Differential Geometry - Christian Bär 2010-05-06

This easy-to-read introduction takes the reader from elementary problems through to current research. Ideal for courses and self-study.

Geometry from a Differentiable Viewpoint - John McCleary 2013

A thoroughly revised second edition of a textbook for a first course in differential/modern geometry that introduces methods within a historical context.

A User's Guide to Spectral Sequences - John McCleary 2001

Spectral sequences are among the most elegant and powerful methods of computation in mathematics. This book describes some of the most important examples of spectral sequences and some of their most spectacular applications. The first part treats the algebraic foundations for this sort of homological algebra, starting from informal calculations. The heart of the text is an exposition of the classical examples from homotopy theory, with chapters on the Leray-Serre spectral sequence, the Eilenberg-Moore spectral sequence, the Adams spectral sequence, and, in this new edition, the Bockstein spectral sequence. The last part of the book treats applications throughout mathematics, including the theory of knots and links, algebraic geometry, differential geometry and algebra. This is an excellent reference for students and researchers in geometry, topology, and algebra.

Computer Graphics and Geometric Modelling - Max K. Agoston 2005-12-06

Possibly the most comprehensive overview of computer graphics as seen in the context of geometric modelling, this two volume work covers implementation and theory in a thorough and systematic fashion. Computer Graphics and Geometric Modelling: Mathematics, contains the mathematical background needed for the geometric modeling topics in computer graphics covered in the first volume. This volume begins with material from linear algebra and a discussion of the transformations in affine & projective geometry, followed by topics from advanced calculus & chapters on general topology, combinatorial topology, algebraic topology, differential topology, differential geometry, and finally algebraic geometry. Two important goals throughout were to explain the material thoroughly, and to make it self-contained. This volume by itself would make a good mathematics reference book, in particular for practitioners in the field of geometric modelling. Due to its broad coverage and emphasis on explanation it could be used as a text for introductory mathematics courses on some of the covered topics, such as topology (general, combinatorial, algebraic, and differential) and geometry (differential & algebraic).

Mathematical Combinatorics, Vol. 3/2012 - Linfan Mao

Papers on Bitopological Supra B-Open Sets, Finsler Space with Randers Conformal Change -Main Scalar, Geodesic and Scalar Curvature, Around The Berge Problem And Hadwiger Conjecture, Odd Harmonious Labeling of Some Graphs, and other topics. Contributors: Agboola A.A.A., Akwu A.O., Oyebo Y.T., M.Lellis Thivagar, B.Meera Devi, H.S.Shukla, Arunima Mishra, Keerti Vardhan Madahar, Ikorong Anouk Gilbert Nemron, G.Mahadevan, Selvam Avadayappan, J.Paulraj Joseph Et Al, and others.

Barycentric Calculus in Euclidean and Hyperbolic Geometry - Abraham A. Ungar 2010

The word barycentric is derived from the Greek word barys (heavy), and refers to center of gravity.

Barycentric calculus is a method of treating geometry by considering a point as the center of gravity of certain other points to which weights are ascribed. Hence, in particular, barycentric calculus provides excellent insight into triangle centers. This unique book on barycentric calculus in Euclidean and hyperbolic geometry provides an introduction to the fascinating and beautiful subject of novel triangle centers in hyperbolic geometry along with analogies they share with familiar triangle centers in Euclidean geometry. As such, the book uncovers magnificent unifying notions that Euclidean and hyperbolic triangle centers share. In his earlier books the author adopted Cartesian coordinates, trigonometry and vector algebra for use in hyperbolic geometry that is fully analogous to the common use of Cartesian coordinates, trigonometry and vector algebra in Euclidean geometry. As a result, powerful tools that are commonly available in Euclidean geometry became available in hyperbolic geometry as well, enabling one to explore hyperbolic geometry in novel ways. In particular, this new book establishes hyperbolic barycentric

coordinates that are used to determine various hyperbolic triangle centers just as Euclidean barycentric coordinates are commonly used to determine various Euclidean triangle centers. The hunt for Euclidean triangle centers is an old tradition in Euclidean geometry, resulting in a repertoire of more than three thousand triangle centers that are known by their barycentric coordinate representations. The aim of this book is to initiate a fully analogous hunt for hyperbolic triangle centers that will broaden the repertoire of hyperbolic triangle centers provided here.

Handbook of Differential Geometry - F.J.E. Dillen 1999-12-16

In the series of volumes which together will constitute the Handbook of Differential Geometry a rather complete survey of the field of differential geometry is given. The different chapters will both deal with the basic material of differential geometry and with research results (old and recent). All chapters are written by experts in the area and contain a large bibliography.