Download A Panoramic View Of Riemannian Geometry

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A Panoramic View of Riemannian Geometry-Marcel Berger 2012-12-06 This book introduces readers to the living topics of Riemannian Geometry and details the main results known to date. The results are stated without detailed proofs but the main ideas involved are described, affording the reader a sweeping panoramic view of almost the entirety of the field. From the reviews "The book has intrinsic value for a student as well as for an experienced geometer. Additionally, it is really a compendium in Riemannian Geometry." -- MATHEMATICAL REVIEWS A Panoramic View of Riemannian Geometry-Marcel Berger 2007-06-29 This book introduces readers to the living topics of Riemannian Geometry and details the main results known to date. The results are stated without detailed proofs but the main ideas involved are described, affording the reader a sweeping panoramic view of

almost the entirety of the field. From the reviews "The book has intrinsic value for a student as well as for an experienced geometer. Additionally, it is really a compendium in Riemannian Geometry." -- MATHEMATICAL REVIEWS A Panoramic View of Riemannian Geometry-Marcel Berger 2012-11-14 This book introduces readers to the living topics of Riemannian Geometry and details the main results known to date. The results are stated without detailed proofs but the main ideas involved are described, affording the reader a sweeping panoramic view of almost the entirety of the field. From the reviews "The book has intrinsic value for a student as well as for an experienced geometer. Additionally, it is really a compendium in Riemannian Geometry." -- MATHEMATICAL REVIEWS Geometry Revealed-Marcel Berger 2010-07-23 Both classical geometry and modern differential geometry have been active subjects of research throughout the 20th century and lie at the heart of many recent advances in mathematics and physics. The underlying motivating concept for the present book is that it offers readers the elements of a modern geometric culture by means of a whole series of visually appealing unsolved (or recently solved) problems that require the creation of concepts and tools of varying abstraction. Starting with such natural, classical objects as lines, planes, circles, spheres, polygons, polyhedra, curves, surfaces, convex sets, etc., crucial ideas and above all abstract concepts needed for attaining the results are elucidated. These are conceptual notions, each built "above" the preceding and permitting an increase in abstraction, represented metaphorically by Jacob's ladder with its rungs: the 'ladder' in the Old Testament, that angels ascended and descended... In all this, the aim of the book is to demonstrate to readers the unceasingly renewed spirit of geometry and that even so-called "elementary" geometry is very much alive and at the very heart of the work of numerous contemporary mathematicians. It is also shown that there are

innumerable paths yet to be explored and concepts to be created. The book is visually rich and inviting, so that readers may open it at random places and find much pleasure throughout according their own intuitions and inclinations. Marcel Berger is t he author of numerous successful books on geometry, this book once again is addressed to all students and teachers of mathematics with an affinity for geometry.

An Introduction to Riemannian Geometry-Leonor Godinho 2014-07-26 Unlike many other texts on differential geometry, this textbook also offers interesting applications to geometric mechanics and general relativity. The first part is a concise and self-contained introduction to the basics of manifolds, differential forms, metrics and curvature. The second part studies applications to mechanics and relativity including the proofs of the Hawking and Penrose singularity theorems. It can be independently used for one-semester courses in either of these subjects. The main ideas are illustrated and further developed by numerous examples and over 300 exercises. Detailed solutions are provided for many of these exercises, making An Introduction to Riemannian Geometry ideal for self-study.

Differential Geometry: Manifolds, Curves, and Surfaces-Marcel Berger 2012-12-06 This book consists of two parts, different in form but similar in spirit. The first, which comprises chapters 0 through 9, is a revised and somewhat enlarged version of the 1972 book Geometrie Differentielle. The second part, chapters 10 and 11, is an attempt to remedy the notorious absence in the original book of any treatment of surfaces in three-space, an omission all the more unforgivable in that surfaces are some of the most common geometrical objects, not only in mathematics but in many branches of physics. Geometrie Differentielle was based on a course I taught in Paris in 1969- 70 and again in 1970-71. In designing this course I was decisively influ enced by a conversation with Serge Lang, and I let myself

be guided by three general ideas. First, to avoid making the statement and proof of Stokes' formula the climax of the course and running out of time before any of its applications could be discussed. Second, to illustrate each new notion with non-trivial examples, as soon as possible after its introduc tion. And finally, to familiarize geometry-oriented students with analysis and analysis-oriented students with geometry, at least in what concerns manifolds.

Curvature in Mathematics and Physics-Shlomo Sternberg 2013-04-17 Expert treatment introduces semi-Riemannian geometry and its principal physical application, Einstein's theory of general relativity, using the Cartan exterior calculus as a principal tool. Prerequisites include linear algebra and advanced calculus. 2012 edition.

Riemannian Geometry-Isaac Chavel 2006-04-10 This book provides an introduction to Riemannian geometry, the geometry of curved spaces, for use in a graduate course. Requiring only an understanding of differentiable manifolds, the author covers the introductory ideas of Riemannian geometry followed by a selection of more specialized topics. Also featured are Notes and Exercises for each chapter, to develop and enrich the reader's appreciation of the subject. This second edition, first published in 2006, has a clearer treatment of many topics than the first edition, with new proofs of some theorems and a new chapter on the Riemannian geometry of surfaces. The main themes here are the effect of the curvature on the usual notions of classical Euclidean geometry, and the new notions and ideas motivated by curvature itself. Completely new themes created by curvature include the classical Rauch comparison theorem and its consequences in geometry and topology, and the interaction of microscopic behavior of the geometry with the macroscopic structure of the space.

Mathematical Omnibus-D. B. Fuks 2007 The book consists of thirty lectures on diverse topics, covering much of the

mathematical landscape rather than focusing on one area. The reader will learn numerous results that often belong to neither the standard undergraduate nor graduate curriculum and will discover connections between classical and contemporary ideas in algebra, combinatorics, geometry, and topology. The reader's effort will be rewarded in seeing the harmony of each subject. The common thread in the selected subjects is their illustration of the unity and beauty of mathematics. Most lectures contain exercises, and solutions or answers are given to selected exercises. A special feature of the book is an abundance of drawings (more than four hundred), artwork by an accomplished artist, and about a hundred portraits of mathematicians. Almost every lecture contains surprises for even the seasoned researcher.
Random Sums and Branching Stochastic Processes-Ibrahim Rahimov 2012-12-06 The aim of this monograph is to show how random sums (that is, the summation of a random number of dependent random variables) may be used to analyse the behaviour of branching stochastic processes. The author shows how these techniques may yield insight and new results when applied to a wide range of branching processes. In particular, processes with reproduction-dependent and non-stationary immigration may be analysed quite simply from this perspective. On the other hand some new characterizations of the branching process without immigration dealing with its genealogical tree can be studied. Readers are assumed to have a firm grounding in probability and stochastic processes, but otherwise this account is self-contained. As a result, researchers and graduate students tackling problems in this area will find this makes a useful contribution to their work.
The Ricci Flow in Riemannian Geometry-Ben Andrews 2011 Focusing on Hamilton's Ricci flow, this volume begins with a detailed discussion of the required aspects of differential geometry. The discussion also includes existence and regularity theory, compactness theorems for Riemannian manifolds,

and much more.
Differential Geometry and Lie Groups-Jean Gallier
Problems in Geometry-Marcel Berger 2013-03-09 Written as a supplement to Marcel Berger's popular two-volume set, Geometry I and II (Universitext), this book offers a comprehensive range of exercises, problems, and full solutions. Each chapter corresponds directly to one in the relevant volume, from which it also provides a summary of key ideas. Where the original Geometry volumes tend toward challenging problems without hints, this book offers a wide range of material that begins at an accessible level, and includes suggestions for nearly every problem. Bountiful in illustrations and complete in its coverage of topics from affine and projective spaces, to spheres and conics, Problems in Geometry is a valuable addition to studies in geometry at many levels.
Differential Geometry-Loring W. Tu 2017-07-01 This text presents a graduate-level introduction to differential geometry for mathematics and physics students. The exposition follows the historical development of the concepts of connection and curvature with the goal of explaining the Chern–Weil theory of characteristic classes on a principal bundle. Along the way we encounter some of the high points in the history of differential geometry, for example, Gauss' Theorema Egregium and the Gauss–Bonnet theorem. Exercises throughout the book test the reader's understanding of the material and sometimes illustrate extensions of the theory. Initially, the prerequisites for the reader include a passing familiarity with manifolds. After the first chapter, it becomes necessary to understand and manipulate differential forms. A knowledge of de Rham cohomology is required for the last third of the text. Prerequisite material is contained in author's text An Introduction to Manifolds, and can be learned in one semester. For the benefit of the reader and to establish common notations, Appendix A recalls the basics of manifold theory. Additionally, in an attempt to make the

exposition more self-contained, sections on algebraic constructions such as the tensor product and the exterior power are included. Differential geometry, as its name implies, is the study of geometry using differential calculus. It dates back to Newton and Leibniz in the seventeenth century, but it was not until the nineteenth century, with the work of Gauss on surfaces and Riemann on the curvature tensor, that differential geometry flourished and its modern foundation was laid. Over the past one hundred years, differential geometry has proven indispensable to an understanding of the physical world, in Einstein's general theory of relativity, in the theory of gravitation, in gauge theory, and now in string theory. Differential geometry is also useful in topology, several complex variables, algebraic geometry, complex manifolds, and dynamical systems, among other fields. The field has even found applications to group theory as in Gromov's work and to probability theory as in Diaconis's work. It is not too far-fetched to argue that differential geometry should be in every mathematician's arsenal.

Differential Geometry in the Large-Heinz Hopf 2003-07-01 These notes consist of two parts: Selected in York 1) Geometry, New 1946, Topics University Notes Peter Lax. by Differential in the 2) Lectures on Stanford Geometry Large, 1956, Notes J.W. University by Gray. are here with no essential They reproduced change. Heinz was a mathematician who mathema- Hopf recognized important tical ideas and new mathematical cases. In the phenomena through special the central idea the of a or difficulty problem simplest background is becomes clear. in this fashion a crystal Doing geometry usually lead serious allows this to to - joy. Hopf's great insight approach for most of the in these notes have become the st- thematics, topics I will to mention a of further try ting- points important developments. few. It is clear from these notes that laid the on Hopf emphasis po- differential Most of the results in smooth differ- hedral geometry. whose is both t1al

have understanding geometry polyhedral counterparts, works I wish to mention and recent important challenging. Among those of Robert on which is much in the Connelly rigidity, very spirit R. and in - of these notes (cf. Connelly, Conjectures questions open International of Mathematicians, H- of gidity, Proceedings Congress sinki vol. 1, 407-414) 1978, .
Algebraic Geometry over the Complex Numbers-Donu Arapura 2012-02-15 This is a relatively fast paced graduate level introduction to complex algebraic geometry, from the basics to the frontier of the subject. It covers sheaf theory, cohomology, some Hodge theory, as well as some of the more algebraic aspects of algebraic geometry. The author frequently refers the reader if the treatment of a certain topic is readily available elsewhere but goes into considerable detail on topics for which his treatment puts a twist or a more transparent viewpoint. His cases of exploration and are chosen very carefully and deliberately. The textbook achieves its purpose of taking new students of complex algebraic geometry through this a deep yet broad introduction to a vast subject, eventually bringing them to the forefront of the topic via a non-intimidating style.
Geometry III-Yu.D. Burago 2013-03-14 A volume devoted to the extremely clear and intrinsically beautiful theory of two-dimensional surfaces in Euclidean spaces. The main focus is on the connection between the theory of embedded surfaces and two-dimensional Riemannian geometry, and the influence of properties of intrinsic metrics on the geometry of surfaces.
Realization Spaces of Polytopes-Jürgen Richter-Gebert 2006-11-14 The book collects results about realization spaces of polytopes. It gives a presentation of the author's "Universality Theorem for 4-polytopes". It is a comprehensive survey of the important results that have been obtained in that direction. The approaches chosen are direct and very geometric in nature. The book is addressed to researchers and to graduate students. The former will find a

comprehensive source for the above mentioned results. The latter will find a readable introduction to the field. The reader is assumed to be familiar with basic concepts of linear algebra.
Riemannian Geometry-Peter Petersen 2006-11-24 This volume introduces techniques and theorems of Riemannian geometry, and opens the way to advanced topics. The text combines the geometric parts of Riemannian geometry with analytic aspects of the theory, and reviews recent research. The updated second edition includes a new coordinate-free formula that is easily remembered (the Koszul formula in disguise); an expanded number of coordinate calculations of connection and curvature; general fomulas for curvature on Lie Groups and submersions; variational calculus integrated into the text, allowing for an early treatment of the Sphere theorem using a forgotten proof by Berger; recent results regarding manifolds with positive curvature.
Special Metrics and Group Actions in Geometry-Simon G. Chiossi 2017-11-27 The volume is a follow-up to the INdAM meeting “Special metrics and quaternionic geometry” held in Rome in November 2015. It offers a panoramic view of a selection of cutting-edge topics in differential geometry, including 4-manifolds, quaternionic and octonionic geometry, twistor spaces, harmonic maps, spinors, complex and conformal geometry, homogeneous spaces and nilmanifolds, special geometries in dimensions 5–8, gauge theory, symplectic and toric manifolds, exceptional holonomy and integrable systems. The workshop was held in honor of Simon Salamon, a leading international scholar at the forefront of academic research who has made significant contributions to all these subjects. The articles published here represent a compelling testimony to Salamon’s profound and longstanding impact on the mathematical community. Target readership includes graduate students and researchers working in Riemannian and complex geometry, Lie theory and

mathematical physics. Nonholonomic Mechanics and Control-A.M. Bloch 2007-09-27 This book explores connections between control theory and geometric mechanics. The author links control theory with a geometric view of classical mechanics in both its Lagrangian and Hamiltonian formulations, and in particular with the theory of mechanical systems subject to motion constraints. The synthesis is appropriate as there is a rich connection between mechanics and nonlinear control theory. The book provides a unified treatment of nonlinear control theory and constrained mechanical systems that incorporates material not available in other recent texts. The book benefits graduate students and researchers in the area who want to enhance their understanding and enhance their techniques. Geometric Mechanics and Symmetry-Darryl D. Holm 2009-07-30 Geometric Mechanics and Symmetry is a friendly and fast-paced introduction to the geometric approach to classical mechanics, suitable for a one- or two- semester course for beginning graduate students or advanced undergraduates. It fills a gap between traditional classical mechanics texts and advanced modern mathematical treatments of the subject.The modern geometric approach illuminates and unifies manyseemingly disparate mechanical problems from several areas of science and engineering. In particular, the book concentrates on the similarities between finite-dimensional rigid body motion and infinite-dimensional systems such asfluid flow. The illustrations and examples, together with a large number of exercises, both solved and unsolved, make the book particularly useful. High-Dimensional Probability-Roman Vershynin 2018-09-30 High-dimensional probability offers insight into the behavior of random vectors, random matrices, random subspaces, and objects used to quantify uncertainty in high dimensions. Drawing on ideas from probability, analysis, and geometry, it lends itself to applications in mathematics, statistics, theoretical computer science, signal

processing, optimization, and more. It is the first to integrate theory, key tools, and modern applications of high-dimensional probability. Concentration inequalities form the core, and it covers both classical results such as Hoeffding's and Chernoff's inequalities and modern developments such as the matrix Bernstein's inequality. It then introduces the powerful methods based on stochastic processes, including such tools as Slepian's, Sudakov's, and Dudley's inequalities, as well as generic chaining and bounds based on VC dimension. A broad range of illustrations is embedded throughout, including classical and modern results for covariance estimation, clustering, networks, semidefinite programming, coding, dimension reduction, matrix completion, machine learning, compressed sensing, and sparse regression.
Global Theory of Minimal Surfaces-Clay Mathematics Institute. Summer School 2005 In the Summer of 2001, the Mathematical Sciences Research Institute (MSRI) hosted the Clay Mathematics Institute Summer School on the Global Theory of Minimal Surfaces. During that time, MSRI became the world center for the study of minimal surfaces: 150 mathematicians - undergraduates, post-doctoral students, young researchers, and world experts - participated in the most extensive meeting ever held on the subject in its 250-year history. The unusual nature of the meeting made it possible to put together this collection of expository lectures and specialized reports, giving a panoramic view of a vital subject presented by leading researchers in the field. The subjects covered include minimal and constant-mean-curvature submanifolds, geometric measure theory and the double-bubble conjecture, Lagrangian geometry, numerical simulation of geometric phenomena, applications of mean curvature to general relativity and Riemannian geometry, the isoperimetric problem, the geometry of fully nonlinear elliptic equations and applications to the topology of three-dimensional manifolds. students and

researchers interested in differential geometry. Information for our distributors: Titles in this series are published by the AMS for the Clay Mathematics Institute (Cambridge, MA).
A Course in Mathematical Logic-Yu.I. Manin 2013-06-29 1. This book is above all addressed to mathematicians. It is intended to be a textbook of mathematical logic on a sophisticated level, presenting the reader with several of the most significant discoveries of the last ten or fifteen years. These include: the independence of the continuum hypothe sis, the Diophantine nature of enumerable sets, the impossibility of finding an algorithmic solution for one or two old problems. All the necessary preliminary material, including predicate logic and the fundamentals of recursive function theory, is presented systematically and with complete proofs. We only assume that the reader is familiar with "naive" set theoretic arguments. In this book mathematical logic is presented both as a part of mathe matics and as the result of its self-perception. Thus, the substance of the book consists of difficult proofs of subtle theorems, and the spirit of the book consists of attempts to explain what these theorems say about the mathematical way of thought. Foundational problems are for the most part passed over in silence. Most likely, logic is capable of justifying mathematics to no greater extent than biology is capable of justifying life. 2. The first two chapters are devoted to predicate logic. The presenta tion here is fairly standard, except that semantics occupies a very domi nant position, truth is introduced before deducibility, and models of speech in formal languages precede the systematic study of syntax.
Noncommutative Geometry and Global Analysis-Henri Moscovici 2011 This volume represents the proceedings of the conference on Noncommutative Geometric Methods in Global Analysis, held in honor of Henri Moscovici, from June 29-July 4, 2009, in Bonn, Germany. Henri Moscovici has made a number of major contributions to

noncommutative geometry, global analysis, and representation theory. This volume, which includes articles by some of the leading experts in these fields, provides a panoramic view of the interactions of noncommutative geometry with a variety of areas of mathematics. It focuses on geometry, analysis and topology of manifolds and singular spaces, index theory, group representation theory, connections of noncommutative geometry with number theory and arithmetic geometry, Hopf algebras and their cyclic cohomology.

A Concrete Introduction to Higher Algebra-Lindsay N. Childs 2012-12-04 An informal and readable introduction to higher algebra at the post-calculus level. The concepts of ring and field are introduced through study of the familiar examples of the integers and polynomials, with much emphasis placed on congruence classes leading the way to finite groups and finite fields. New examples and theory are integrated in a well-motivated fashion and made relevant by many applications -- to cryptography, coding, integration, history of mathematics, and especially to elementary and computational number theory. The later chapters include expositions of Rabiin's probabilistic primality test, quadratic reciprocity, and the classification of finite fields. Over 900 exercises, ranging from routine examples to extensions of theory, are scattered throughout the book, with hints and answers for many of them included in an appendix.

A Course in Metric Geometry-Dmitri Burago 2001 ``Metric geometry'' is an approach to geometry based on the notion of length on a topological space. This approach experienced a very fast development in the last few decades and penetrated into many other mathematical disciplines, such as group theory, dynamical systems, and partial differential equations. The objective of this graduate textbook is twofold: to give a detailed exposition of basic notions and techniques used in the theory of length spaces, and, more generally, to offer an

elementary introduction into a broad variety of geometrical topics related to the notion of distance, including Riemannian and Carnot-Caratheodory metrics, the hyperbolic plane, distance-volume inequalities, asymptotic geometry (large scale, coarse), Gromov hyperbolic spaces, convergence of metric spaces, and Alexandrov spaces (non-positively and non-negatively curved spaces). The authors tend to work with ``easy-to-touch'' mathematical objects using ``easy-to-visualize'' methods. The authors set a challenging goal of making the core parts of the book accessible to first-year graduate students. Most new concepts and methods are introduced and illustrated using simplest cases and avoiding technicalities. The book contains many exercises, which form a vital part of the exposition.

Complex Variables-Francis J. Flanigan 1983-01-01 Contents include calculus in the plane; harmonic functions in the plane; analytic functions and power series; singular points and Laurent series; and much more. Numerous problems and solutions. 1972 edition.

Bernhard Riemann 1826–1866-Detlef Laugwitz 2009-06-08 The name of Bernard Riemann is well known to mathematicians and physicists around the world. His name is indelibly stamped on the literature of mathematics and physics. This remarkable work, rich in insight and scholarship, is addressed to mathematicians, physicists, and philosophers interested in mathematics. It seeks to draw those readers closer to the underlying ideas of Riemann’s work and to the development of them in their historical context. This illuminating English-language version of the original German edition will be an important contribution to the literature of the history of mathematics.

Riemannian Geometry-Sylvestre Gallot 2004-07-30 This book covers the topics of differential manifolds, Riemannian metrics, connections, geodesics and curvature, with special emphasis on the intrinsic features of the subject. It treats in detail classical results on the relations between curvature and topology. The book features

numerous exercises with full solutions and a series of detailed examples are picked up repeatedly to illustrate each new definition or property introduced.
Visual Group Theory-Nathan Carter 2009-12-31 Group theory is the branch of mathematics that studies symmetry, found in crystals, art, architecture, music and many other contexts, but its beauty is lost on students when it is taught in a technical style that is difficult to understand. Visual Group Theory assumes only a high school mathematics background and covers a typical undergraduate course in group theory from a thoroughly visual perspective. The more than 300 illustrations in Visual Group Theory bring groups, subgroups, homomorphisms, products, and quotients into clear view. Every topic and theorem is accompanied with a visual demonstration of its meaning and import, from the basics of groups and subgroups through advanced structural concepts such as semidirect products and Sylow theory.
Uncertainty Principles on Riemannian Manifolds-Wolfgang Erb 2011 In this thesis, the Heisenberg-Pauli-Weyl uncertainty principle on the real line and the Breitenberger uncertainty on the unit circle are generalized to Riemannian manifolds. The proof of these generalized uncertainty principles is based on an operator theoretic approach involving the commutator of two operators on a Hilbert space. As a momentum operator, a special differential-difference operator is constructed which plays the role of a generalized root of the radial part of the Laplace-Beltrami operator. Further, it is shown that the resulting uncertainty inequalities are sharp. In the final part of the thesis, these uncertainty principles are used to analyze the space-frequency behavior of polynomial kernels on compact symmetric spaces and to construct polynomials that are optimally localized in space with respect to the position variance of the uncertainty principle.
Mixed Hodge Structures-Chris A.M. Peters 2008-02-27 This is comprehensive basic monograph on mixed Hodge

structures. Building up from basic Hodge theory the book explains Delingne's mixed Hodge theory in a detailed fashion. Then both Hain's and Morgan's approaches to mixed Hodge theory related to homotopy theory are sketched. Next comes the relative theory, and then the all encompassing theory of mixed Hodge modules. The book is interlaced with chapters containing applications. Three large appendices complete the book.

An Introduction to Manifolds-Loring W. Tu 2010-10-05 Manifolds, the higher-dimensional analogs of smooth curves and surfaces, are fundamental objects in modern mathematics. Combining aspects of algebra, topology, and analysis, manifolds have also been applied to classical mechanics, general relativity, and quantum field theory. In this streamlined introduction to the subject, the theory of manifolds is presented with the aim of helping the reader achieve a rapid mastery of the essential topics. By the end of the book the reader should be able to compute, at least for simple spaces, one of the most basic topological invariants of a manifold, its de Rham cohomology. Along the way, the reader acquires the knowledge and skills necessary for further study of geometry and topology. The requisite point-set topology is included in an appendix of twenty pages; other appendices review facts from real analysis and linear algebra. Hints and solutions are provided to many of the exercises and problems. This work may be used as the text for a one-semester graduate or advanced undergraduate course, as well as by students engaged in self-study. Requiring only minimal undergraduate prerequisites, 'Introduction to Manifolds' is also an excellent foundation for Springer's GTM 82, 'Differential Forms in Algebraic Topology'.

New Trends in One-Dimensional Dynamics-Maria José Pacifico 2019-12-14 This volume presents the proceedings of the meeting New Trends in One-Dimensional Dynamics, which celebrated the 70th birthday of Welington de Melo and was held at the IMPA, Rio de

Janeiro, in November 2016. Highlighting the latest results in one-dimensional dynamics and its applications, the contributions gathered here also celebrate the highly successful meeting, which brought together experts in the field, including many of Welington de Melo's co-authors and former doctoral students. Sadly, Welington de Melo passed away shortly after the conference, so that the present volume became more a tribute to him. His role in the development of mathematics was undoubtedly an important one, especially in the area of low-level dynamics, and his legacy includes, in addition to many articles with fundamental contributions, books that are required reading for all newcomers to the field.
Comparison Theorems in Riemannian Geometry-Cheeger 2009-01-15
Comparison Theorems in Riemannian Geometry
Dirac Operators in Riemannian Geometry-Thomas Friedrich 2000
Examines the Dirac operator on Riemannian manifolds, especially its connection with the underlying geometry and topology of the manifold. The presentation includes a review of Clifford algebras, spin groups and the spin representation, as well as a review of spin structures and spin [superscript C] structures. With this foundation established, the Dirac operator is defined and studied, with special attention to the cases of Hermitian manifolds and symmetric spaces. Then, certain analytic properties are established, including self-adjointness and the Fredholm property. An important link between the geometry and the analysis is provided by estimates for the eigenvalues of the Dirac operator in terms of the scalar curvature and the sectional curvature. Considerations of Killing spinors and solutions of the twistor equation on M lead to results about whether M is an Einstein manifold or conformally equivalent to one. Finally, in an appendix, Friedrich gives a concise introduction to the Seiberg-Witten invariants, which are a powerful tool for the study of four-manifolds. There is also an appendix reviewing principal bundles and connections.

3+1 Formalism in General Relativity-Éric Gourgoulhon 2012-02-27 This graduate-level, course-based text is devoted to the 3+1 formalism of general relativity, which also constitutes the theoretical foundations of numerical relativity. The book starts by establishing the mathematical background (differential geometry, hypersurfaces embedded in space-time, foliation of space-time by a family of space-like hypersurfaces), and then turns to the 3+1 decomposition of the Einstein equations, giving rise to the Cauchy problem with constraints, which constitutes the core of 3+1 formalism. The ADM Hamiltonian formulation of general relativity is also introduced at this stage. Finally, the decomposition of the matter and electromagnetic field equations is presented, focusing on the astrophysically relevant cases of a perfect fluid and a perfect conductor (ideal magnetohydrodynamics). The second part of the book introduces more advanced topics: the conformal transformation of the 3-metric on each hypersurface and the corresponding rewriting of the 3+1 Einstein equations, the Isenberg-Wilson-Mathews approximation to general relativity, global quantities associated with asymptotic flatness (ADM mass, linear and angular momentum) and with symmetries (Komar mass and angular momentum). In the last part, the initial data problem is studied, the choice of spacetime coordinates within the 3+1 framework is discussed and various schemes for the time integration of the 3+1 Einstein equations are reviewed. The prerequisites are those of a basic general relativity course with calculations and derivations presented in detail, making this text complete and self-contained. Numerical techniques are not covered in this book.

The Shape of Space-Jeffrey R. Weeks 2001-12-12 Maintaining the standard of excellence set by the previous edition, this textbook covers the basic geometry of two- and three-dimensional spaces Written by a master expositor, leading researcher in the field, and MacArthur Fellow,

it includes experiments to determine the true shape of the universe and contains

illustrated examples and engaging exer