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Differential Forms and Applications Differential Forms and Connections **Differential Forms Tensors, Differential Forms, and Variational Principles** *Differential Forms and the Geometry of General Relativity* **A Geometric Approach to Differential Forms** *Differential Forms* **Differential Forms with Applications to the Physical Sciences** *A Visual Introduction to Differential Forms and Calculus on Manifolds* **Differential Forms Rational Homotopy Theory and Differential Forms Cohomology and Differential Forms** *Differential Forms in Algebraic Topology* **Advanced Calculus Visual Differential Geometry and Forms** *Differential Forms* Global Analysis **Differential Forms Geometry of Differential Forms Vector Calculus, Linear Algebra, and Differential Forms Student Solution Manual to Accompany the 4th Edition of Vector Calculus, Linear Algebra, and Differential Forms, a Unified Approach** *Advanced Calculus* Differential Forms in Algebraic Topology **Geometrical Methods of Mathematical Physics** Differential Forms **Inequalities for Differential Forms** Invariants of Quadratic Differential Forms **Typical Singularities of Differential 1-forms and Pfaffian Equations** Problems and Solutions in Differential Geometry, Lie Series, Differential Forms, Relativity and Applications **Residues and Traces of Differential Forms Via Hochschild Homology Differentiability in Banach Spaces, Differential Forms and Applications** *Differential Forms in Electromagnetics* Differential Forms on Singular Varieties **Conformal Symmetry Breaking Operators for Differential Forms on Spheres An Introduction to Manifolds** *Differential Forms in Mathematical Physics* **Invariants of Quadratic Differential Forms** The Pullback Equation for Differential Forms **Regular Differential Forms Manifolds, Vector Fields, and Differential Forms**

The famous mathematician addresses both pure and applied branches of mathematics in a book equally essential as a text, reference, or a brilliant mathematical exercise. "Superb." — Mathematical Review. 1971 edition. Differential Forms on Singular Varieties: De Rham and Hodge Theory Simplified uses complexes of differential forms to give a complete treatment of the Deligne theory of mixed Hodge structures on the cohomology of singular spaces. This book features an approach that employs recursive arguments on dimension and does not introduce spaces of hig This text presents differential forms from a geometric perspective accessible at the undergraduate level. It begins with basic concepts such as partial differentiation and multiple integration and gently develops the entire machinery of differential forms. The subject is approached with the idea that complex concepts can be built up by analogy from simpler cases, which, being inherently geometric, often can be best understood visually. Each new concept is presented with a natural picture that students can easily grasp. Algebraic properties then follow. The book contains excellent motivation, numerous illustrations and solutions to selected problems. This completely revised and corrected version of the well-known Florence notes circulated by the authors together with E. Friedlander examines basic topology, emphasizing homotopy theory. Included is a discussion of Postnikov towers and rational homotopy theory. This is then followed by an in-depth look at differential forms and de Tham’s theorem on simplicial complexes. In addition, Sullivan’s results on computing the rational homotopy type from forms is presented. New to the Second Edition: *Fully-revised appendices including an expanded discussion of the Hirsch lemma *Presentation of a natural proof of a Serre spectral sequence result *Updated content throughout the book, reflecting advances in the area of homotopy theory With its modern approach and timely revisions, this second edition of Rational Homotopy Theory and Differential Forms will be a valuable resource for graduate students and researchers in algebraic topology, differential forms, and homotopy theory. This monograph is the first one to systematically present a series of local and global estimates and inequalities for differential forms, in particular the ones that satisfy the A-harmonic equations. The presentation focuses on the Hardy-Littlewood, Poincare, Cacciooli, imbedded and reverse Holder inequalities. Integral estimates for operators, such as homotopy operator, the Laplace-Beltrami operator, and the gradient operator are discussed next. Additionally, some related topics such as BMO inequalities, Lipschitz classes, Orlicz spaces and inequalities in Carnot groups are discussed in the concluding chapter. An abundance of bibliographical references and historical material supplement the text throughout. This rigorous presentation requires a familiarity with topics such as differential forms, topology and Sobolev space theory. It will serve as an invaluable reference for researchers, instructors and graduate students in analysis and partial differential equations and could be used as additional material for specific courses in these fields. Developed from a first-year graduate course in algebraic topology, this text is an informal introduction to some of the main ideas of contemporary homotopy and cohomology theory. The materials are structured around four core areas: de Rham theory, the Cech-de Rham complex, spectral sequences, and characteristic classes. By using the de Rham theory of differential forms as a prototype of cohomology, the machineries of algebraic topology are made easier to assimilate. With its stress on concreteness, motivation, and readability, this book is equally suitable for self-study and as a one-semester course in topology. An inviting, intuitive, and visual exploration of differential geometry and forms Visual Differential Geometry and Forms fulfills two principal goals. In the first four acts, Tristan Needham puts the geometry back into differential geometry. Using 235 hand-drawn diagrams, Needham deploys Newton’s geometrical methods to provide geometrical explanations of the classical results. In the fifth act, he offers the first undergraduate introduction to differential forms that treats advanced topics in an intuitive and geometrical manner. Unique features of the first four acts include: four distinct geometrical proofs of the fundamentally important Global Gauss-Bonnet theorem, providing a stunning link between local geometry and global topology; a simple, geometrical proof of Gauss’s famous Theorema Egregium; a complete geometrical treatment of the Riemann curvature tensor of an n-manifold; and a detailed geometrical treatment of Einstein’s field equation, describing gravity as curved spacetime (General Relativity), together with its implications for gravitational waves, black holes, and cosmology. The final act elucidates such topics as the unification of all the integral theorems of vector calculus; the elegant reformulation of Maxwell’s equations of electromagnetism in terms of 2-forms; de Rham cohomology; differential geometry via Cartan’s method of moving frames; and the calculation of the Riemann tensor using curvature 2-forms. Six of the seven chapters of Act V can be read completely independently from the rest of the book. Requiring only basic calculus and geometry, Visual Differential Geometry and Forms provocatively rethinks the way this important area of mathematics should be considered and taught. Singularities and the classification of 1-forms and Pfaffian equations are interesting not only as classical problems, but also because of their applications in contact geometry, partial differential equations, control theory, nonholonomic dynamics, and variational problems. In addition to collecting results on the geometry of singularities and classification of differential forms and Pfaffian equations, this monograph discusses applications and closely related classification problems. Zhitomirskii presents proofs with all results and ends each chapter with a summary of the main results, a tabulation of the singularities, and a list of the normal forms. The main results of the book are also collected together in the introduction. Incisive, self-contained account of tensor analysis and the calculus of exterior differential forms, interaction between the concept of invariance and the calculus of variations. Emphasis is on analytical techniques. Includes problems. A working knowledge of differential forms so strongly illuminates the calculus and its developments that it ought not be too long delayed in the curriculum. On the other hand, the systematic treatment of differential forms requires an apparatus of topology and algebra which is heavy for beginning undergraduates. Several texts on advanced calculus using differential forms have appeared in recent years. We may cite as representative of the variety of approaches the books of Fleming [2], (1) Nickerson-Spencer-Steenrod [3], and Spivak [6]. . Despite their accommodation to the innocence of their readers, these texts cannot lighten the burden of apparatus exactly because they offer a more or less full measure of the truth at some level of generality in a formally precise exposition. There. is consequently a gap between texts of this type and the traditional advanced calculus. Recently, on the occasion of offering a beginning course of advanced calculus, we undertook the expe- ment of attempting to present the technique of differential forms with minimal apparatus and very few prerequisites. These notes are the result of that experiment. Our exposition is intended to be heuristic and concrete. Roughly speaking, we take a differential form to be a multi-dimensional integrand, such a thing being subject to rules making change-of-variable calculations automatic. The domains of integration (manifolds) are explicitly given "surfaces" in Euclidean space. The differentiation of forms (exterior (1) Numbers in brackets refer to the Bibliography at the end. This work is the first systematic study of all possible conformally covariant differential operators transforming differential forms on a Riemannian manifold X into those on a submanifold Y with focus on the model space (X, Y) = (Sn, Sn-1). The authors give a complete classification of all such conformally covariant differential operators, and find their explicit formulæ in the flat coordinates in terms of basic operators in differential geometry and classical hypergeometric polynomials. Resulting families of operators are natural generalizations of the Rankin–Cohen brackets for modular forms and Juhl's operators from conformal holography. The matrix-valued factorization identities among all possible combinations of conformally covariant differential operators are also established. The main machinery of the proof relies on the "F-method" recently introduced and developed by the authors. It is a general method to construct intertwining operators between C?-induced representations or to find singular vectors of Verma modules in the context of branching rules, as solutions to differential equations on the Fourier transform side. The book gives a new extension of the F-method to the matrix-valued case in the general setting, which could be applied to other problems as well. This book offers a self-contained introduction to the analysis of symmetry breaking operators for infinite-dimensional representations of reductive Lie groups. This feature will be helpful for active scientists and accessible to graduate students and young researchers in differential geometry, representation theory, and theoretical physics. Since the times of Gauss, Riemann, and Poincare, one of the principal goals of the study of manifolds has been to relate local analytic properties of a manifold with its global topological properties. Among the high points on this route are the Gauss-Bonnet formula, the de Rham complex, and the Hodge theorem; these results show, in particular, that the central tool in reaching the main goal of global analysis is the theory of differential forms. The book by Morita is a comprehensive introduction to differential forms. It begins with a quick introduction to the notion of differentiable manifolds and then develops basic properties of differential forms as well as fundamental results concerning them, such as the de Rham and Frobenius theorems. The second half of the book is devoted to more advanced material, including Laplacians and harmonic forms on manifolds, the concepts of vector bundles and fiber bundles, and the theory of characteristic classes. Among the less traditional topics treated is a detailed description of the Chern-Weil theory. The book can serve as a textbook for undergraduate students and for graduate students in geometry. The final third of the book applies the mathematical ideas to important areas of physics: Hamiltonian mechanics, statistical mechanics, and electrodynamics." "There are many classroom-tested exercises and examples with excellent figures throughout. The book is ideal as a text for a first course in differential geometry, suitable for advanced undergraduates or graduate students in mathematics or physics."--BOOK JACKET. This textbook serves as an introduction to modern differential geometry at a level accessible to advanced undergraduate and master's students. It places special emphasis on motivation and understanding, while developing a solid intuition for the more abstract concepts. In contrast to graduate level references, the text relies on a minimal set of prerequisites: a solid grounding in linear algebra and multivariable calculus, and ideally a course on ordinary differential equations. Manifolds are introduced intrinsically in terms of coordinate patches glued by transition functions. The theory is presented as a natural continuation of multivariable calculus; the role of point-set topology is kept to a minimum. Questions sprinkled throughout the text engage students in active learning, and encourage classroom participation. Answers to these questions are provided at the end of the book, thus making it ideal for independent study. Material is further reinforced with homework problems ranging from straightforward to challenging. The book contains more material than can be covered in a single semester, and detailed suggestions for instructors are provided in the Preface. In a book written for mathematicians, teachers of mathematics, and highly motivated students, Harold Edwards has taken a bold and unusual approach to the presentation of advanced calculus. He begins with a lucid discussion of differential forms and quickly moves to the fundamental theorems of calculus and Stokes’ theorem. The result is genuine mathematics, both in spirit and content, and an exciting choice for an honors or graduate course or indeed for any mathematician in need of a refreshingly informal and flexible reintroduction to the subject. For all these potential readers, the author has made the approach work in the best tradition of creative mathematics. This affordable softcover reprint of the 1994 edition presents the diverse set of topics from which advanced calculus courses are created in beautiful unifying generalization. The author emphasizes the use of differential forms in linear algebra, implicit differentiation in higher dimensions using the calculus of differential forms, and the method of Lagrange multipliers in a general but easy-to-use formulation. There are copious exercises to help guide the reader in testing understanding. The chapters can be read in almost any order, including beginning with the final chapter that contains some of the more traditional topics of advanced calculus courses. In addition, it is ideal for a course on vector analysis from the differential forms point of view. The professional mathematician will find here a delightful example of mathematical literature; the student fortunate enough to have gone through this book will have a firm grasp of the nature of modern mathematics and a solid framework to continue to more advanced studies. The most important feature...is that it is fun—it is fun to read the exercises, it is fun to read the comments printed in the margins, it is fun simply to pick a random spot in the book and begin reading. This is the way mathematics should be presented, with an excitement and liveliness that show why we are interested in the subject. —The American Mathematical Monthly (First Review) An inviting, unusual, high-level introduction to vector calculus, based solidly on differential forms. Superb exposition: informal but sophisticated, down-to-earth but general, geometrically rigorous, entertaining but serious. Remarkable diverse applications, physical and mathematical. —The American Mathematical Monthly (1994) Based on the Second Edition Differential Forms in Mathematical Physics An application of differential forms for the study of some local and global aspects of the differential geometry of surfaces. Differential forms are introduced in a simple way that will make them attractive to "users" of mathematics. A brief and elementary introduction to differentiable manifolds is given so that the main theorem, namely Stokes' theorem, can be presented in its natural setting. The applications consist in developing the method of moving frames expounded by E. Cartan to study the local differential geometry of immersed surfaces in R3 as well as the intrinsic geometry of surfaces. This is then collated in the last chapter to present Chern's proof of the Gauss-Bonnet theorem for compact surfaces. Differential forms are a powerful mathematical technique to help students, researchers, and engineers solve problems in geometry and analysis, and their applications. They both unify and simplify results in concrete settings, and allow them to be clearly and effectively generalized to more abstract settings. Differential Forms has gained high recognition in the mathematical and scientific community as a powerful computational tool in solving research problems and simplifying very abstract problems. Differential Forms, 2nd Edition, is a solid resource for students and professionals needing a general understanding of the mathematical theory and to be able to apply that theory into practice. Provides a solid theoretical basis of how to develop and apply differential forms to real research problems Includes computational methods to enable the reader to effectively use differential forms Introduces theoretical concepts in an accessible manner This monograph explores the cohomological theory of manifolds with various sheaves and its application to differential geometry. Based on lectures given by author Izu Vaisman at Romania's University of Iasi, the treatment is suitable for advanced undergraduates and graduate students of mathematics as well as mathematical researchers in differential geometry, global analysis, and topology. A self-contained development of cohomological theory constitutes the central part of the book. Topics include categories and functors, the ?ech cohomology with coefficients in sheaves, the theory of fiber bundles, and differentiable, foliated, and complex analytic manifolds. The final chapter covers the theorems of de Rham and Dolbeault-Serre and examines the theorem of Allendoerfer and Eells, with applications of these theorems to characteristic classes and the general theory of harmonic forms. Introducing the tools of modern differential geometry--exterior calculus, manifolds, vector bundles, connections--this textbook covers both classical surface theory, the modern theory of connections, and curvature. With no knowledge of topology assumed, the only prerequisites are multivariate calculus and linear algebra. There already exist a number of excellent graduate textbooks on the theory of differential forms as well as a handful of very good undergraduate textbooks on multivariable calculus in which this subject is briefly touched upon but not elaborated on enough.The goal of this textbook is to be readable and usable for undergraduates. It is entirely devoted to the subject of differential forms and explores a lot of its important ramifications.In particular, our book provides a detailed and lucid account of a fundamental result in the theory of differential forms which is, as a rule, not touched upon in undergraduate texts: the isomorphism between the ?ech cohomology groups of a differential manifold and its de Rham cohomology groups. An introduction to multivectors, dyadics, and differential forms for electrical engineers While physicists have long applied differential forms to various areas of theoretical analysis, dyadic algebra is also the most natural language for expressing electromagnetic phenomena mathematically. George Deschamps pioneered the application of differential forms to electrical engineering but never completed his work. Now, Ismo V. Lindell, an internationally recognized authority on differential forms, provides a clear and practical introduction to replacing classical Gibbsian vector calculus with the mathematical formalism of differential forms. In Differential Forms in Electromagnetics, Lindell simplifies the notation and adds memory aids in order to ease the reader's leap from Gibbsian analysis to differential forms, and provides the algebraic tools corresponding to the dyadics of Gibbsian analysis that have long been missing from the formalism. He introduces the reader to basic EM theory and wave equations for the electromagnetic two-forms, discusses the derivation of useful identities, and explains novel ways of treating problems in general linear (bi-anisotropic) media. Clearly written and devoid of unnecessary mathematical jargon, Differential Forms in Electromagnetics helps engineers master an area of intense interest for anyone involved in research on metamaterials. Differential Forms and the Geometry of General Relativity provides readers with a coherent path to understanding relativity. Requiring little more than calculus and some linear algebra, it helps readers learn just enough differential geometry to grasp the basics of general relativity. The book contains two intertwined but distinct halves. Designed for advanced undergraduate or beginning graduate students in mathematics or physics, most of the text requires little more than familiarity with calculus and linear algebra. The first half presents an introduction to general relativity that describes some of the surprising implications of relativity without introducing more formalism than necessary. This nonstandard approach uses differential forms rather than tensor calculus and minimizes the use of "index gymnastics" as much as possible. The second half of the book takes a more detailed look at the mathematics of differential forms. It covers the theory behind the mathematics used in the first half by emphasizing a conceptual understanding instead of formal proofs. The book provides a language to describe curvature, the key geometric idea in general relativity. Developed from a first-year graduate course in algebraic topology, this text is an informal introduction to some of the main ideas of contemporary homotopy and cohomology theory. The materials are structured around four core areas: de Rham theory, the Cech-de Rham complex, spectral sequences, and characteristic classes. By using the de Rham theory of differential forms as a prototype of cohomology, the machineries of algebraic topology are made easier to assimilate. With its stress on concreteness, motivation, and readability, this book is equally suitable for self-study and as a one-semester course in topology. This book is divided into two parts, the first one to study the theory of differentiable functions between Banach spaces and the second to study the differential form formalism and to address the Stokes' Theorem and its applications. Related to the first part, there is an introduction to the content of Linear Bounded Operators in Banach Spaces with classic examples of compact and Fredholm operators, this aiming to define the derivative of Fréchet and to give examples in Variational Calculus and to extend the results to Fredholm maps. The Inverse Function Theorem is explained in full details to help the reader to understand the proof details and its motivations. The inverse function theorem and applications make up this first part. The text contains an elementary approach to Vector Fields and Flows, including the Frobenius Theorem. The Differential Forms are introduced and applied to obtain the Stokes Theorem and to define De Rham cohomology groups. As an application, the final chapter contains an introduction to the Harmonic Functions and a geometric approach to Maxwell's equations of electromagnetism. 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'. This book is a high-level introduction to vector calculus based solidly on differential forms. Informal but sophisticated, it is geometrically and physically intuitive yet mathematically rigorous. It offers remarkably diverse applications, physical and mathematical, and provides a firm foundation for further studies. This text is one of the first to treat vector calculus using differential forms in place of vector fields and other outdated techniques. Geared towards students taking courses in multivariable calculus, this innovative book aims to make the subject more readily understandable. Differential forms unify and simplify the subject of multivariable calculus, and students who learn the subject as it is presented in this book should come away with a better conceptual understanding of it than those who learn using conventional methods. * Treats vector calculus using differential forms * Presents a very concrete introduction to differential forms * Develops Stokess theorem in an easily understandable way * Gives well-supported, carefully stated, and thoroughly explained definitions and theorems. * Provides glimpses of further topics to entice the interested student An important question in geometry and analysis is to know when two k-forms f and g are equivalent through a change of variables. The problem is therefore to find a map ? so that it satisfies the pullback equation: ?*(g) = f. In more physical terms, the question under consideration can be seen as a problem of mass transportation. The problem has received considerable attention in the cases k = 2 and k = n, but much less when 3 ? k ? n–1. The present monograph provides the first comprehensive study of the equation. The work begins by recounting various properties of exterior forms and differential forms that prove useful throughout the book. From there it goes on to present the classical Hodge–Morrey decomposition and to give several versions of the Poincaré lemma. The core of the book discusses the case k = n, and then the case 1? k ? n–1 with special attention on the case k = 2, which is fundamental in symplectic geometry. Special emphasis is given to optimal regularity, global results and boundary data. The last part of the work discusses Hölder spaces in detail; all the results presented here are essentially classical, but cannot be found in a single book. This section may serve as a reference on Hölder spaces and therefore will be useful to mathematicians well beyond those who are only interested in the pullback equation. The Pullback Equation for Differential Forms is a self-contained and concise monograph intended for both geometers and analysts. The book may serve as a valuable reference for researchers or a supplemental text for graduate courses or seminars. This book is aimed at students and researchers in commutative algebra, algebraic geometry, and neighboring disciplines. The book will provide readers with new insight into differential forms and may stimulate new research through the many open questions it raises. The authors introduce various sheaves of differential forms for equidimensional morphisms of finite type between noetherian schemes, the most important being the sheaf of regular differential forms. It is known in many cases that the top degree regular differentials form a dualizing sheaf in the sense of duality theory. All constructions in the book are purely local and require only prerequisites from the theory of commutative noetherian rings and their Kahler differentials. The authors study the relations between the sheaves under consideration and give some applications to local properties of morphisms.The investigation of the 'fundamental class', a canonical homomorphism from Kahler to regular differential forms, is a major topic. The book closes with applications to curve singularities. While regular differential forms have been previously studied mainly in the 'absolute case' (that is, for algebraic varieties over fields), this book deals with the relative situation. Moreover, the authors strive to avoid 'separability assumptions'. Once the construction of regular differential forms is given, many results can be transferred from the absolute to the relative case. This book explains and helps readers to develop geometric intuition as it relates to differential forms. It includes over 250 figures to aid understanding and enable readers to visualize the concepts being discussed. The author gradually builds up to the basic ideas and concepts so that definitions, when made, do not appear out of nowhere, and both the importance and role that theorems play is evident as or before they are presented. With a clear writing style and easy-to- understand motivations for each topic, this book is primarily aimed at second- or third-year undergraduate math and physics students with a basic knowledge of vector calculus and linear algebra. Requiring only some understanding of homological algebra and commutative ring theory, this book will give those who have encountered Grothendieck residues in geometry or complex analysis a better understanding of residues, as well as an appreciation of Hochschild homology. While numerous papers have treated the topic of residues from a variety of viewpoints, no books have addressed this topic. The author fills this gap by using Hochschild homology to provide a natural, general, and easily accessible approach to residues, and by identifying connections with other treatments of residues. Developing a theory of the Grothendieck symbol by means of elementary homological and commutative algebra, the author derives residues from a simple pairing between Hochschild homology and cohomology groups, and defines all concepts along the way. The author also establishes some functorial properties and introduces certain trace and cotrace maps with potential use in other contexts. This volume presents a collection of problems and solutions in differential geometry with applications. Both introductory and advanced topics are introduced in an easy-to-digest manner, with the materials of the volume being self-contained. In particular, curves, surfaces, Riemannian and pseudo-Riemannian manifolds, Hodge duality operator, vector fields and Lie series, differential forms, matrix-valued differential forms, Maurer–Cartan form, and the Lie derivative are covered. Readers will find useful applications to special and general relativity, Yang–Mills theory, hydrodynamics and field theory. Besides the solved problems, each chapter contains stimulating supplementary problems and software implementations are also included. The volume will not only benefit students in mathematics, applied mathematics and theoretical physics, but also researchers in the field of differential geometry. Request Inspection Copy In recent years the methods of modern differential geometry have become of considerable importance in theoretical physics and have found application in relativity and cosmology, high-energy physics and field theory, thermodynamics, fluid dynamics and mechanics. This textbook provides an introduction to these methods - in particular Lie derivatives, Lie groups and differential forms - and covers their extensive applications to theoretical physics. The reader is assumed to have some familiarity with advanced calculus, linear algebra and a little elementary operator theory. The advanced physics undergraduate should therefore find the presentation quite accessible. This account will prove valuable for those with backgrounds in physics and applied mathematics who desire an introduction to the subject. Having studied the book, the reader will be able to comprehend research papers that use this mathematics and follow more advanced pure-mathematical expositions. A graduate-level text utilizing exterior differential forms in the analysis of a variety of mathematical problems in the physical and engineering sciences. Includes 45 illustrations. Index. An early tract for students of differential geometry and mathematical physics.

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