1. Record Nr. UNINA9910360852403321

Autore	Rosén Andreas
Titolo	Geometric multivector analysis : from Grassmann to Dirac / / Andreas Rosén
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Birkhäuser, , [2019] ©2019
ISBN	9783030314118 3-030-31411-1
Descrizione fisica	1 online resource (XIII, 465 pages, 29 illustrations., 8 illustrations. in color.)
Collana	Birkhäuser Advanced Texts Basler Lehrbücher, , 2296-4894
Disciplina	512.5
Soggetti	Algebras, Linear Global analysis (Mathematics) Manifolds (Mathematics) Differential equations Integral equations Geometry, Differential Linear Algebra Global Analysis and Analysis on Manifolds Differential Equations Integral Equations Differential Geometry Anàlisi global (Matemàtica) Àlgebra lineal Geometria diferencial Equacions diferencials Equacions integrals Varietats (Matemàtica)
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Prelude: Linear algebra -- Exterior algebra -- Clifford algebra --

Mappings of inner product spaces -- Spinors in inner product spaces -- Interlude: Analysis -- Exterior calculus -- Hodge decompositions -- Hypercomplex analysis -- Dirac equations -- Multivector calculus on manifolds -- Two index theorems.

Sommario/riassunto

This book presents a step-by-step guide to the basic theory of multivectors and spinors, with a focus on conveying to the reader the geometric understanding of these abstract objects. Following in the footsteps of M. Riesz and L. Ahlfors, the book also explains how Clifford algebra offers the ideal tool for studying spacetime isometries and Möbius maps in arbitrary dimensions. The book carefully develops the basic calculus of multivector fields and differential forms, and highlights novelties in the treatment of, e.g., pullbacks and Stokes's theorem as compared to standard literature. It touches on recent research areas in analysis and explains how the function spaces of multivector fields are split into complementary subspaces by the natural first-order differential operators, e.g., Hodge splittings and Hardy splittings. Much of the analysis is done on bounded domains in Euclidean space, with a focus on analysis at the boundary. The book also includes a derivation of new Dirac integral equations for solving Maxwell scattering problems, which hold promise for future numerical applications. The last section presents down-to-earth proofs of index theorems for Dirac operators on compact manifolds, one of the most celebrated achievements of 20th-century mathematics. The book is primarily intended for graduate and PhD students of mathematics. It is also recommended for more advanced undergraduate students, as well as researchers in mathematics interested in an introduction to geometric analysis.