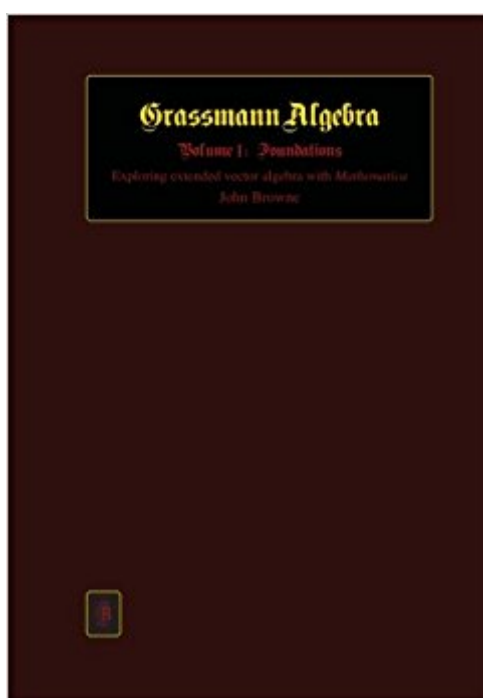The book was found

Grassmann Algebra Volume 1: Foundations: Exploring Extended Vector Algebra With Mathematica

Synopsis

Grassmann Algebra Volume 1: Foundations Exploring extended vector algebra with Mathematica Grassmann algebra extends vector algebra by introducing the exterior product to algebraicize the notion of linear dependence. With it, vectors may be extended to higher-grade entities: bivectors, trivectors, ... multivectors. The extensive exterior product also has a regressive dual: the regressive product. The pair behaves a little like the Boolean duals of union and intersection. By interpreting one of the elements of the vector space as an origin point, points can be defined, and the exterior product can extend points into higher-grade located entities from which lines, planes and multiplanes can be defined. Theorems of Projective Geometry are simply formulae involving these entities and the dual products. By introducing the (orthogonal) complement operation, the scalar product of vectors may be extended to the interior product of multivectors, which in this more general case may no longer result in a scalar. The notion of the magnitude of vectors is extended to the magnitude of multivectors: for example, the magnitude of the exterior product of two vectors (a bivector) is the area of the parallelogram formed by them. To develop these foundational concepts, we need only consider entities which are the sums of elements of the same grade. This is the focus of this volume. But the entities of Grassmann algebra need not be of the same grade, and the possible product types need not be constricted to just the exterior, regressive and interior products. For example quaternion algebra is simply the Grassmann algebra of scalars and bivectors under a new product operation. Clifford, geometric and higher order hypercomplex algebras, for example the octonions, may be defined similarly. If to these we introduce Clifford's invention of a scalar which squares to zero, we can define entities (for example dual quaternions) with which we can perform elaborate transformations. Exploration of these entities, operations and algebras will be the focus of the volume to follow this. There is something fascinating about the beauty with which the mathematical structures that Hermann Grassmann discovered describe the physical world, and something also fascinating about how these beautiful structures have been largely lost to the mainstreams of mathematics and science. He wrote his seminal Ausdehnungslehre (Die Ausdehnungslehre. Vollständig und in strenger Form) in 1862. But it was not until the latter part of his life that he received any significant recognition for it, most notably by Gibbs and Clifford. In recent times David Hestenes' Geometric Algebra must be given the credit for much of the emerging awareness of GrassÂ-mann's innovation. In the hope that the book be accessible to scientists and engineers, students and professionals alike, the text attempts to avoid any terminology which does not make an essential contribution to an understanding of the basic concepts. Some familiarity with basic linear algebra may however be useful. The book is written using Mathematica, a powerful

system for doing mathematics on a computer. This enables the theory to be cross-checked with computational explorations. However, a knowledge of Mathematica is not essential for an appreciation of Grassmann's beautiful ideas.

Book Information

Paperback: 588 pages

Publisher: CreateSpace Independent Publishing Platform (September 17, 2012)

Language: English

ISBN-10: 1479197637

ISBN-13: 978-1479197637

Product Dimensions: 7 x 1.3 x 10 inches

Shipping Weight: 2.8 pounds (View shipping rates and policies)

Average Customer Review: 5.0 out of 5 stars   5 customer reviews

Best Sellers Rank: #522,049 in Books (See Top 100 in Books)   #44 in Books > Science & Math > Mathematics > Applied > Vector Analysis

Customer Reviews

The publication of this book, Grassmann Algebra by John Browne, is a watershed event. According to the author, "the focus of these books [a second volume on applications is in preparation] is to provide a readable account in modern notation of Grassmann's major algebraic contributions to mathematics and science." I believe that the author has succeeded in realizing his goal. The only background required is linear algebra.For those who have never heard of Grassmann Algebra, let me address this question: as a subject, is Hermann Grassmann's algebra worth studying? Gauging by its influence, I would say `most definitely'. For instance, the vector calculus used in physics and engineering is a tailoring (by Gibbs and Heaviside) of Grassmann's algebra ([...]). Geometric Algebra, used in physics, engineering and computer science, was developed by William Clifford and based on the work of Grassmann ([...]). The list goes on. Here is an interesting biography of Elie Cartan that refers to Hermann Grassmann ([...]).If Hermann Grassmann's work is so influential why haven't you heard of him or his work? Unfortunately, Grassmann's mathematical work was generally unappreciated in his life. To quote Wikipedia, "The Die Lineale Ausdehnungslehre (1844) by Hermann Grassmann was a revolutionary text, too far ahead of its time to be appreciated [...])." In the end, is seems that those who did understand Grassmann's work, had to adapt it into various forms that were more accessible to the larger mathematical community. The adaptations became the primary sources. This resulted in Grassmann's work being forgotten except by a few specialists.

Recent interest in Geometric Algebra has had the side effect of increasing interest in Grassmann Algebra. However, until the publication of Grassmann Algebra by John Browne, there has been no "one-stop" resource that provides the full mathematical story of Grassmann Algebra.So what should you expect from the book "Grassmann Algebra" by John Browne? The story takes over 500 pages to tell. Along the way, there will likely be concepts that you know, such as point and vector, whose definitions will change in subtle ways from those that you've heard before. There will likely be ideas that will be totally new, e.g., the idea of multiplying a point and a vector. The chapters start with the simplest and work their way to more sophisticated notions. Throughout, you will likely see a very neat interplay between geometry and algebra. It is this interplay that forms a main theme and keeps one's attention and interest. Chapter by chapter the picture of the entire system becomes more complete. All the terms are clearly defined. The pace is very even. To facilitate learning, the book is integrated with a Mathematica package which I found helpful.I find it very curious that Grassmann, in the forward of his 1862 book, Die Ausdehnungslehre, states that "a time will come when it [the results of all his efforts] will be drawn forth from the dust of oblivion and the ideas laid down here will bear fruit..." I believe that the time that Grassmann was speaking about is now and that John Browne's book initiates the period where Grassmann's work will move from obscurity to its rightful place in the mathematical sciences.

It has been said that unless you can program the computer to calculate something, you don't really understand the concept behind such calculation. The author, having written Mathematica programs to calculate just about every conceivable Grassmann algebraic concept, is well-positioned to explain Grassmann algebra in clear details. I have read much of his book on-line a few years ago, but am glad to have my own copy now.

Today, Grassman's Algebra has come into its own after languishing for too many years in obscurity. Grassman's Algebra is also known as "Algebraic Geometry" meaning that it's possible to work out geometric relationships by means of algebra. There are many new concepts in this algebra, especially those that involve dimension. It's very nice to have everything in one place when something like this emerges because it's a pleasure to have a readable and good reference book. Something that's not mentioned that's of an enormous benefit is a CD that is included that can be used in conjunction with Mathematica. This presents the beneficial interactive environment that's required for a great learning experience.

The best entertainment $30 will provide. The gift that keeps on giving.

A classic

Grassmann Algebra Volume 1: Foundations: Exploring extended vector algebra with Mathematica Principia Mathematica - Volume Two Principia Mathematica - Volume Three Structural Dynamics of Earthquake Engineering: Theory and Application Using Mathematica and Matlab (Woodhead Publishing Series in Civil and Structural Engineering) Computer-Aided Analysis of Electric Machines: A Mathematica Approach Schaum's Outline of Mathematica, 2ed (Schaum's Outlines) Hands-On Start to Wolfram Mathematica: And Programming with the Wolfram Language Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations On Formally Undecidable Propositions of Principia Mathematica and Related Systems A First Course in Scientific Computing: Symbolic, Graphic, and Numeric Modeling Using Maple, Java, Mathematica, and Fortran90 by Rubin H. Landau (2005-05-01) The Beatles - All These Years - Extended Special Edition: Volume One: Tune In Vector Mechanics for Engineers: Statics & Dynamics (Combined Volume) Exploring Microsoft Office 2016 Volume 1 (Exploring for Office 2016 Series) Nutritional Foundations and Clinical Applications: A Nursing Approach, 5e (Foundations and Clinical Applications of Nutrition) Foundations of GMAT Math, 5th Edition (Manhattan GMAT Preparation Guide: Foundations of Math) ITIL®v3 Foundations: A Time-Compressed Resource To Passing The ITIL®v3 Foundations Exam On Your 1st Attempt! (Cram to Pass) Study Guide for Foundations of Maternal-Newborn and Women's Health Nursing, 6e (Murray, Study Guide for Foundations of Maternal-Newborn & Women's Health Nursing) Foundations in Nursing Research (6th Edition) (Nieswiadomy, Foundations of Nursing Research) Foundations of American Education: Becoming Effective Teachers in Challenging Times, Enhanced Pearson eText with Loose-Leaf Version-- Access Card ... New in Foundations / Intro to Teaching) Foundations of American Education, Enhanced Pearson eText with Loose-Leaf Version -- Access Card Package (8th Edition) (What's New in Foundations / Intro to Teaching)