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Linear Algebra Via Exterior Products



Synopsis

This is a pedagogical introduction to the coordinate-free approach in basic finite-dimensional linear algebra. The reader should be already exposed to the array-based formalism of vector and matrix calculations. This book makes extensive use of the exterior (anti-commutative, "wedge") product of vectors. The coordinate-free formalism and the exterior product, while somewhat more abstract, provide a deeper understanding of the classical results in linear algebra. Without cumbersome matrix calculations, this text derives the standard properties of determinants, the Pythagorean formula for multidimensional volumes, the formulas of Jacobi and Liouville, the Cayley-Hamilton theorem, the Jordan canonical form, the properties of Pfaffians, as well as some generalizations of these results.

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Customer Reviews

I was delighted to find that this book existed. I had often wondered how linear algebra might look, were the subject developed from scratch using exterior products. I first found the concept of the 'exterior algebra' of a vector space in 'Abstract Linear Algebra' by Morton L Curtis. I was fascinated by the concept from the start. In particular, I had always found the idea of the 'determinant' of a square matrix rather puzzling. It is easy enough to calculate for a two-by-two matrix. And the rule for finding determinants for three-by-three matrices in terms of the alternating sum of three two-by-two cases were clear enough too. In fact, as you might be aware, for any three-by-three matrix there are SIX ways of calculating it. But why do these turn out to be the same? And why is the determinant defined this way anyway? Why $\det AB = \det A \det B$? This book answers all of those questions and

more. For this I cannot praise it highly enough. The notation at times I find a little too intricate and occasionally counter-intuitive, although one gets used to this. The author is also to be praised for making this book available FREE as a PDF file on the web - in these days where students in the UK pay more than ever for tuition, every little saving must help. For me, given the very reasonable price for this on , I bought it here without hesitation. The luxury of having a paper copy makes it well worth the outlay. This book, above all others, I recommend to all of my students interested in going a little deeper with linear algebra. Thanks to Sergei Winitzki for giving to us all this book in a way that demonstrates great integrity, as well as the courage to do mathematics in a different way. Exterior products now seem to be coming more into fashion - I feel sure that this book must have helped in some measure.

This book is a refreshing change from "pearls before swine" books like Hoffman and Kunze. Its conversational style is full of insights, many of which are quite charming. If you find linear algebra boring, this book is for you. Yes, linear algebra can be fun! Moreover, the content is just what you need to progress to the general form of Stokes Theorem. I cannot recommend this book too highly.

This book doesn't have the best approach to linear algebra; the main objective of this book is to become more familiar with the "Exterior Product", to this extent this book is fantastic. Develops both the algebraic properties for the wedge product and goes on to give the intuition behind it, this book furthered my understanding of Exterior Algebra that otherwise would've been left fumbling around in the dark.

Excellent book and excellent service!

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