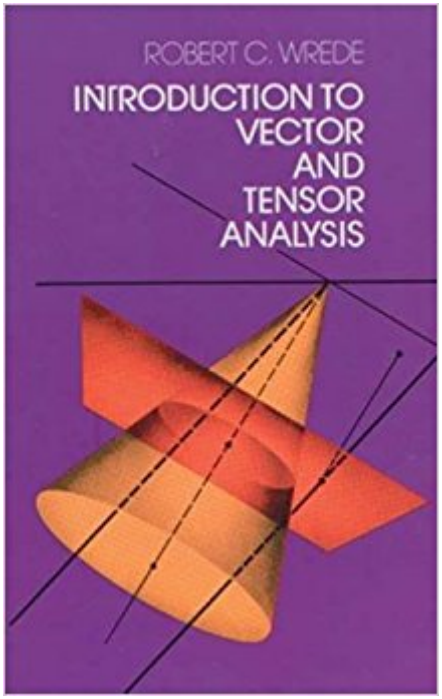
Introduction To Vector And Tensor Analysis (Dover Books On Mathematics)



Synopsis

This broad introduction to vector and tensor analysis is designed for the advanced undergraduate or graduate student in mathematics, physics, and engineering as well as for the practicing engineer or physicist who needs a theoretical understanding of these essential mathematical tools. In recent years, the vector approach has found its way even into writings on aspects of biology, economics, and other sciences.The many and various topics covered include: the algebra of vectors Ã¢â ¬â • linear dependence and independence, transformation equations, the inner product, the cross product, and the algebra of matrixes; the differentiation of vectors Ã¢â ¬â • geometry of space curves, kinematics, moving frames of reference, Newtonian orbits and special relativity theory; partial differentiation of vectors Ã¢â ¬â • geometry of space curves, kinematics, moving frames of reference, Newtonian orbits and special relativity theory; partial differentiation and associated concepts Ã¢â ¬â • surface representations, bases in general coordinate systems, and maxima and minima of functions of two variables; the integration of vectors Ã¢â ¬â • line integrals, surface integrals, surface tensors and volume integrals; tensor algebra and analysis Ã¢â ¬â • fundamental notions of Ã Â n-space, transformations and tensors, Riemannian geometry, tensor processes of differentiation, geodesics, the curvature tensor and its algebraic properties, and general relativity theory.Throughout, Professor Wrede stresses the interrelationships between algebra and geometry, and moves frequently from one to the other. As he points out, vector and tensor analysis provides a kind of bridge between elementary aspects of linear algebra, geometry and analysis. He uses the classical notation for vector analysis, but introduces a more appropriate new notation for tensors, which he correlates with the common vector notation. He stresses proofs and concludes each section with a set of problems designed to help the student get a solid grasp of the ideas, and explore them more thoroughly on his own. His approach features a combination of important historical material with up-to-date developments in both fields. The knowledge of vector and tensor analysis gained in this way is excellent preparation for further studies in differential geometry, applied mathematics, and theoretical physics.

Book Information

Series: Dover Books on Mathematics
Paperback: 418 pages
Publisher: Dover Publications; Revised edition (June 1, 1972)
Language: English
ISBN-10: 048661879X

ISBN-13: 978-0486618791
Product Dimensions: 5.4 x 0.9 x 8.5 inches
Shipping Weight: 14.4 ounces (View shipping rates and policies)
Average Customer Review: 3.9 out of 5 stars 12 customer reviews
Best Sellers Rank: #1,203,448 in Books (See Top 100 in Books) #88 inÃ Â Books > Science & Math > Mathematics > Applied > Vector Analysis #2912 inÃ Â Books > Textbooks > Science & Mathematics > Mathematics > Algebra & Trigonometry #3826 inÃ Â Books > Science & Math > Mathematics > Pure Mathematics > Algebra

Customer Reviews

A very good book. The exercises are well thought out, and require a little critical thinking (unlike modern text books). I used this book as additional reference material for my matrix theory class. The best element of this book is that applications in physics are utilized in almost every chapter. Do not be thrown off by the notation used in the book. Yes, the author’s notation can be confusing, but he uses it in order to get the student familiar with tensor notation. As an engineering student, it is beneficial to be familiar with different notations in mathematics, and this book will add to any student’s mathematical syntax.

Occasionally just a little abstract for my mind, but overall I found this a really good reference. The title is Vector and Tensor Analysis and, unsurprisingly thats exactly what you get.

An excellent book for anyone interested in vector and tensor analysis.

This is a fine intro to vector and tensor analysis -- when Fred Flintstone lived and dinosaurs walked the earth. The modern approach is to use the language and results of differential forms and to consider "geometric objects" living on manifolds, whose components transform in certain ways under coordinate changes. In contrast, the prehistoric method is to define things to be contravariant vectors, covariant vectors (really 1-forms in today’s language) and metric tensors if their components transform in certain ways. This is the the kind of tensor analysis Einstein learnt. This is the style you will find in Adler, Bazin, and Schiffer’s book on general relativity. Given modern perspectives and tools, this is exactly the way not to learn it today. I bought a copy merely to contrast this antiquated approach with the modern ones that’s been in vogue since the time of Elie Cartan. If you want a modern text, try Janich’s "Vector Analysis."

I think this book is beyond a simple introduction. First half of the book is Vector Analysis and other half is mixture of transformations and Tensor analysis. It covers a lot and has examples for each concept. What I did not like was that the concepts were introduced from general to particular. So if you are not exposed to Vector or Tensor analysis, it is not easy to follow a new concept defined on n-dimensional space and see application on two dimensional space.So it was a good refresher with some applications to Physics but for new starter it is difficult especially for self lerner. Also definitions were very abstract, dry without any meaning attached to it. I can not considered this book as a course book by itself.

This is, without a doubt, the best text I have ever studied on the subject of vector and tensor analysis (and believe me, there have been many). As the author describes, it is written for those who seek to work with the subject in a theoretical mindset, and yet it is not devoid of empirical applications. Wrede takes us so much further than our rudimentary understandings, which most of us acquired in our basic undergrad and grad studies. Proper definitions are given with a special attention to detail. However, the text is not overly rigorous. His notation is very user friendly and accommodating, and his exercises are perfect for mathematics, physics, or engineering majors. For example, if you’re a math major, you can focus on the exercises associated with proofs and conjecture. Physics majors can work problems associated with the big picture concepts, where our quantities are of-course associated with mass, length, and time. The engineering major will be delighted to find particular problems associated with the rote calculations of quantities in the structural, electromagnetic, and fluid disciplines, amongst many others.Because his definitions are so precise, the sections should be read through slowly, or perhaps even two or three times to acquire a full and proper understanding. Yet, the benefits of doing so are enormous. For example, most of us who read this text are familiar with the "position vector", but how many of us actually know that it is not really a vector at all? As all vectors are tensors, and as tensors are invariant under coordinate transformations, the "position vector", or as I now prefer to call it, the radius arrow, could not possibly be a vector. That is due to the fact that the "position vector" is bound to the origin in the coordinate system in which it is described. Clearly, something as simple as a linear transformation in R2 will force it to vary, and thus, since the "position vector" is not invariant under coordinate transformations, we could not possibly consider it a vector.Wrede’s text is full of useful information that will guide people in their studies of full analysis in vectors and tensors. Learning those analysis techniques, is absolutely essential in developing one’s own theories for describing

the wonderment of our universe. When you're ready to move beyond the basic problem solving skills associated with multi-variable calculus and physics, then you are ready for Wrede. Five Stars from me; incredible book!

In order to facilitate the judgement of my review I will introduce myself. I am a retired professor of physiology with a background in medical physics. Since I have always wanted to grasp the relativity theory of Einstein, but did not have the necessary background in vector and tensor analysis, I am now studying in this area to fulfill my dream. I have tried several books on this subject and found Robert C Wrede's book to be the best. I have found his explanations rigorous and clear. No confusing errors as a matter of fact no errors. The reason for looking up this title on the internet again is that I enjoyed this title so much that I would like to order an additional copy with hard cover. One of the positive aspect of this title are the well chosen examples and exercises with always correct answers of the odd numbered ones in the back. An additional plus is that the author provides short historical background throughout the text.

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