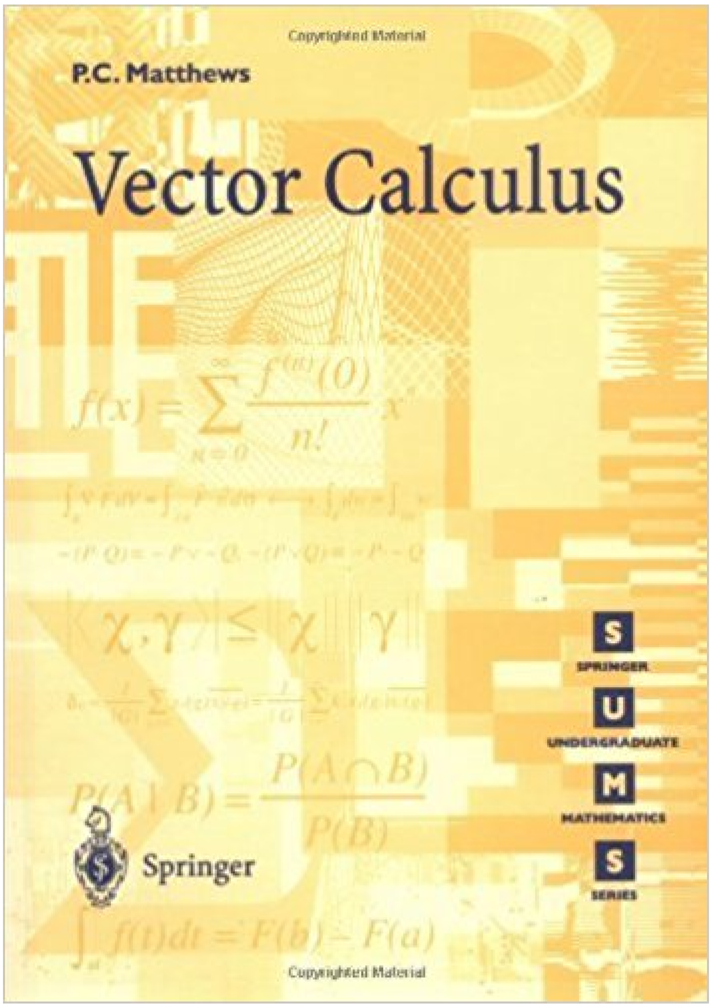
Vector Calculus (Springer Undergraduate Mathematics Series)



Synopsis

Vector calculus is the fundamental language of mathematical physics. It proÃ Â- vides a way to describe physical quantities in three-dimensional space and the way in which these quantities vary. Many topics in the physical sciences can be analysed mathematically using the techniques of vector calculus. These topÃ Â- ics include fluid dynamics, solid mechanics and electromagnetism, all of which involve a description of vector and scalar quantities in three dimensions. This book assumes no previous knowledge of vectors. However, it is assumed that the reader has a knowledge of basic calculus, including differentiation, integration and partial differentiation. Some knowledge of linear algebra is also required, particularly the concepts of matrices and determinants. The book is designed to be self-contained, so that it is suitable for a proÃ Â- gramme of individual study. Each of the eight chapters introduces a new topic, and to facilitate understanding of the material, frequent reference is made to physical applications. The physical nature of the subject is clarified with over sixty diagrams, which provide an important aid to the comprehension of the new concepts. Following the introduction of each new topic, worked examples are provided. It is essential that these are studied carefully, so that a full unÃ Â- derstanding is developed before moving ahead. Like much of mathematics, each section of the book is built on the foundations laid in the earlier sections and chapters.

Book Information

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Customer Reviews

Like most other Springer books published under SUMS (Springer Undergraduate Mathematics Series) category, it shows following traits:1) it follows a down to earth approach.2) it is brief (if you cut out table of content, preface, index etc, you have 179 pages of reading material).3) there are worked out examples in pretty much all sections.4) exercises are at the end of each chapter. Worked out and fairly detailed solutions are at the end of the book.Like other reviewers have mentioned, this book does not contain much of proof. Instead, explanations are given to justify a formula or how a formula can be thought of.Another thing worth mentioning is the usage of Physics in this book. Author does make use of Physical examples sometimes, for example in section 1.2.1, Matthews uses F.d (force dot displacement) to illustrate application of dot product. These stuff are elementary Physics though. The more deeper usage of Physics is seen is at the end of the book. Last section of Chapter 7 provides two physical examples of tensor, namely Ohm’s law and inertia tensor. Finally, the last chapter is all about Application of Vector Calculus which again involves Physics.This book does NOT require you to know about vectors before hand. Infact, chapter one is all about vectors and it’s properties (addition, dot product, cross etc). Even if you already know about vectors, it won’t hurt to take a brief glimpse at this chapter.This book should NOT be used as your only source for Vector Calculus course. I’ve heard some people say they’ve used this book as a text for Multivariable Calculus course, if you’re in similar course, please get an additional text for yourself. I used Jon Rogawski’s Calculus...quite of a decent book imo. A lot of other people recommend Stewart (i haven’t used this one personally but i hear it’s good). The issue is this book just does not have enough exercises for you. Plus, there is a whole lot more stuff covered in typical Multivariable text but is absent on this one (arc length, curvature, center of mass, tangent planes, directional derivatives, optimization and Lagrange multipliers to name a few). On contrary, the book covers Suffix Notation, Curvilinear coordinates, Cartesian Tensor, and Physical Applications which typically are absent in Multivariable text.chapter on Suffix Notation is quite a good one actually. I was taking "Mathematical Methods for Physicist" course where our professor quickly went over Kronecker delta and alternating tensor and kept using it for quite some time. I had to look into this book to understand what they meant and how they can facilitate calculation involving gradient.

This is a good introductory overview for people new to the subject, or who need to dip into it for an application. It quickly gets to the point and tells you what everything means. But it has one quirk: The author thinks the plural of "suffix" is "suffices." It is not and never has been. It is "suffixes." In Latin the x was not the last letter of the word.

its selection of problems and its focus on vector calculus are both quite good. Perhaps both are excellent, but my current experience and intuition in this subject area prevent me from being more certain.Either way, a much more physically intuitive approach with more problem-solution examples and less geometrical rigor is possible, that much is certain.Most importantly, in-text solutions are provided. There is no problem with merely an answer, all have something more. There are way fewer problems as compared to a schaum’s outline (on the order of 30 times fewer). Though it also costs two or three times more than a Schaum’s, it’s certainly much more physically intuitive than the Schaum’s on vector/tensor analysis by Murray R. Spiegel.I think this book would make its publisher and author a lot more money (by selling a hell of a lot more of them) if it were reduced in price. It would be a win-win for everybody who, I’m pretty certain, matters here.

Excellent text packed with lots of good information.

concise and clear. exercises are good too.

If your goal is to build a quick working knowledge of vector calculus, you’ve found the right book. Prof. Matthews offers a succinct, informal overview of the major areas of vector calculus used in introductory undergraduate courses in physics and engineering. Topics include the usual suspects: vector algebra; line, surface, and volume integrals; gradients, divergence, curl, and Laplacians; the divergence and Stokes’ theorems; and cylindrical and spherical coordinate systems. As a bonus, he discusses suffix (i.e., Einstein) notation and tensors in Cartesian coordinates. The latter is a nice addition, although the chapter is so short it serves as little more than a teaser. His concluding chapter on applications of vector calculus to heat transfer, electromagnetism, and continuum mechanics is of little value. While it’s interesting to apply your new skills, the discussions are so brief that a reader unfamiliar with these fields will be left manipulating abstract symbols with little understanding of their physical significance.You’ll also find a dozen or so exercises (with full solutions!) at the end of each chapter, making this book great for self-study. The problems span a wide range of difficulty, with some trivial and some head-scratching. On average I’d rate them a 5 on a sale of 1 to 10.I agree with other reviews that this book is not appropriate if you’re looking for a mathematically rigorous approach. Prof. Matthews presents the material as he would in a first-year multivariable calculus class, with little formalism or rigrous proof. This slim volume’s purpose is clear: Accelerate an able student to minimum competence as quickly and painlessly as possible. Hard core math nerds should look elsewhere.

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