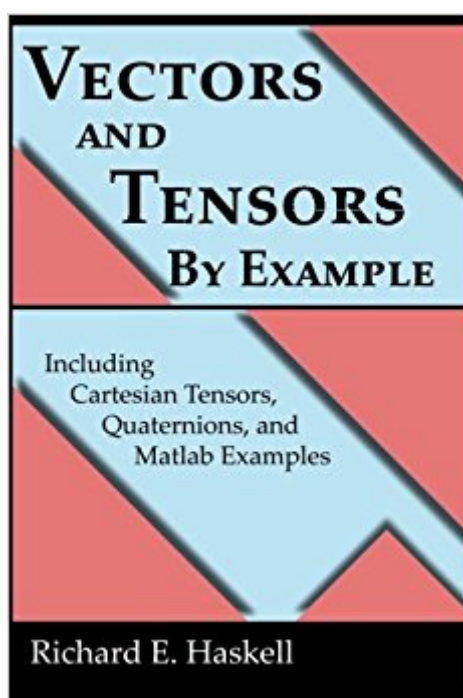


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# Vectors And Tensors By Example: Including Cartesian Tensors, Quaternions, And Matlab Examples



## Synopsis

If you have been confused by vectors, vector calculus, tensor analysis, or quaternions, this book is for you. Packed with examples, including Matlab examples, this book will show you: How to use Matlab to calculate dot and cross products, and solve linear equations; How to prove any vector identity using Cartesian tensors; How to derive the expressions for gradient, divergence, Laplacian, and curl in any curvilinear coordinate system; How to understand covariant and contravariant components of a vector; The meaning of Christoffel symbols in covariant differentiation; How to derive the curvature tensor; How quaternions can be used to describe vector rotations in 3-D space.

## Book Information

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## Customer Reviews

Richard E. Haskell is Emeritus Professor of Engineering in the Department of Electrical and Computer Engineering in Oakland University's School of Engineering and Computer Science. He received his Ph.D. from Rensselaer Polytechnic Institute in 1963. Following three years in the Air Force, where he conducted research at the Air Force Cambridge Research Laboratories at Hanscom Field in Bedford, MA, he joined the faculty at Oakland University in Rochester, MI, where he helped to establish the new School of Engineering (later to become the School of Engineering and Computer Science). He served on the faculty at Oakland University for 46 years, where he developed and taught a wide variety of undergraduate and graduate courses, including courses in electromagnetic theory, coherent optics, pattern recognition, computer programming, microprocessors, embedded systems and digital design. His research interests included plasma physics, holography and coherent optics, pattern recognition and image processing, computer learning, and microprocessor applications and embedded systems. He is the author of over 30

books, ranging from Plasma Dynamics to Digital Design.

First of all, an earlier edition of this book was published in a Programmed Instruction format (ISBN: 0-13-500942-1, Prentice-Hall) in 1972. The current text differs due to the absence of the Programmed Instruction format and the presence of Matlab code used for calculating cross products, dot products, magnitudes of vectors, and solving systems of linear equations, etc. Without Matlab the reader will be at a disadvantage. In addition, no solutions manual is available for the problems at the end of the 14 chapters! There is no indication as to where one could be found. If one is available, I apologize. The book published in 1972 provided solutions to all problems. If one could find a copy of this earlier edition it would be a good idea to try it first. However, the earlier version doesn't cover Quaternions. I own both of these books. The new issue of the text has better graphics and an index. The remainder of this review involves the new book: Vectors and Tensors By Example (ISBN: 978-151553115, Richard E. Haskell, Inc.) If you are completely new to the world of Vectors and Tensors, make sure that you are comfortable with multivariable calculus. If you are not comfortable, don't give up! This book actually does an excellent job in strengthening one's background in deriving vector and tensor relationships in 3-D to describe physical phenomena. The thing I find to be most useful is the utility of Einstein summation notation in the compact description and manipulation of scalars, vectors and, tensors. If you aren't familiar with it don't panic. It may take a while to get use to. However, once it starts to sink in, its utility is indisputable. You will wonder how you survived without it! As you read this book and do the exercises, you'll begin to feel comfortable with the Divergence Theorem, Stokes' Theorem, Green's Identities, and how to derive and apply them. As you progress through the book you will be able to recall various proofs, with understanding, on your own. The book has some cosmetic pluses: the print is large, the pages are uncluttered, the figures are very helpful, there are many worked examples in the body of the text. Don't be discouraged by the number of pages, 307. The amount of print on each page leaves a lot of white space, which facilitates reading. The difficulty with the book increases rapidly starting with Chapter 10 and remains that way for remaining Chapters 11, 12, 13, and 14. These five Chapters comprise Tensor Analysis and Quaternions which may loosely be consider to involve coordinate systems that are not orthogonal (axes intersecting at 90 degree angles) and limited to 3-dimensions. At this point the ability to visualize what is occurring is not possible. That being said this book may be an excellent starting point for those interested in the field and have a very solid background in 3-D calculus and/or willing to challenge themselves! I am giving this book 4 stars because it doesn't provide solutions to the end-of-chpt problems. Finally, I have one other complaint. The book is

difficult to keep open as one reads and attempts to work the problems The earlier book was about 2 inches longer in height and width but of the same thickness; it stayed open to the selected pages. The missing solutions to the indicated problem and/or lack of a reference to their availability is the only reason I reduced my rating to 4 stars..

If you do not have access to MATLAB, for a very minimal expenditure of time and effort you can get OCTAVE for free.OCTAVE is a MATLAB clone, freely available and provides all the functionality required for this text.This is a nice little book with lots of practical examples.It is a good introduction to quaternions and rigid rotations in 3D-space.Good price too.

This book is excellent. I recommend.I am a beginner in the study of Tensor Calculus (TC) and has picked up several books to understand this subject.Many books skip important parts or explain the subject of confusing or obscure.This book is the best book to start on this subject. It explains everything in detail, clearly, teaching and excellent thread. Correlates the symbolic notation, matrix, indicial and grafical (when applicable).I recommend this book to all who wish to start in TC and even for those who want to lighten topics already known.I desire to appear any book on Continuum Mechanics with the same teaching, clarity and objectivity of Professor Haskell.

With matlab in hand, this really is the best tensors for people without alot of mathematical confidence (dummies) around. Lots of examples , well designed to test understanding and correct most of my misconceptions , plenty of good problems at the end of each chapter.Problem : no solutions manual.Since there seems to be a trend towards understanding electrodynamics with quaternions (especialy useful if dealing with any special relativity ) I loved the primer to quaternions in the last chapter.No solutions to problems makes it a bit difficult to make sure that I understand things correctly.

Excellent book, readable, not too much rigor, but stressing understanding the math, and not just manipulating symbols. It also is a fairly good introduction to using elementary MatLab. I would recommend reading this book before taking formal course.

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