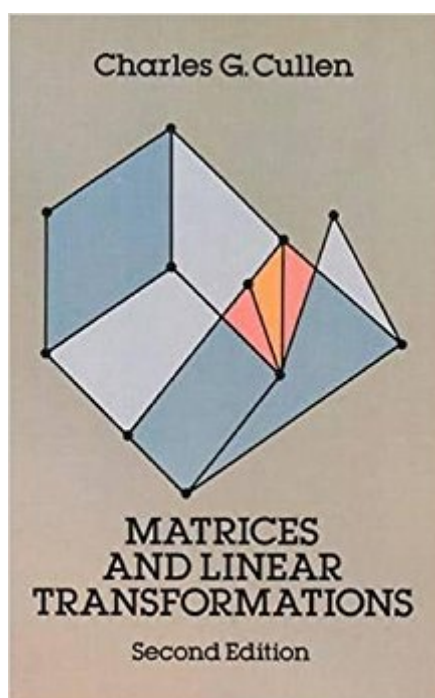


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# Matrices And Linear Transformations: Second Edition (Dover Books On Mathematics)



## Synopsis

"Comprehensive . . . an excellent introduction to the subject." —*Electronic Engineer's Design Magazine*. This introductory textbook, aimed at sophomore- and junior-level undergraduates in mathematics, engineering, and the physical sciences, offers a smooth, in-depth treatment of linear algebra and matrix theory. The major objects of study are matrices over an arbitrary field. Contents include Matrices and Linear Systems; Vector Spaces; Determinants; Linear Transformations; Similarity: Part I and Part II; Polynomials and Polynomial Matrices; Matrix Analysis; and Numerical Methods. The first seven chapters, which require only a first course in calculus and analytic geometry, deal with matrices and linear systems, vector spaces, determinants, linear transformations, similarity, polynomials, and polynomial matrices. Chapters 8 and 9, parts of which require the student to have completed the normal course sequence in calculus and differential equations, provide introductions to matrix analysis and numerical linear algebra, respectively. Among the key features are coverage of spectral decomposition, the Jordan canonical form, the solution of the matrix equation  $AX = XB$ , and over 375 problems, many with answers.

## Book Information

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## Customer Reviews

Charles Cullen's original goal was to "provide a text, requiring a minimum number of prerequisites, which would enable me, in a one-term course, to cover...linear algebra and matrix theory." This volume does so in the first five chapters and continues with four additional chapters designed to support a second term. He suggests as background "only" an introductory course in calculus and

analytic geometry. The first chapter introduces basic matrix operations such as addition, multiplication, transposition and inversion. Chapter 2 covers vector spaces and the concepts of linear independence and rank. Chapters 3 and 4 introduce and elaborate matrix determinants and linear transformations. Chapter 5 develops the Jordan canonical form using invariant subspaces and direct sum decompositions. Chapters 6 and 7 take an alternative path to explaining the Jordan canonical form. Chapters 8 and 9 use concepts and tools from previous chapters to introduce matrix analysis and numerical analysis. I bought this book for an online matrix algebra course when I found the required text, *Matrix Algebra: An Introduction*, less than helpful. Even though the course text was targeted toward social scientists like myself, its explanations and formula derivations were less helpful than its examples. I found Cullen's book and it got me through the course. In addition to clear explanations, practice exercises with answers, and helpful organization, it was also less expensive and covered more material. I recommend this book to those needing a refresher in matrix methods or approaching them for the first time.

This book is a very good book for someone wanting to dive into Linear algebra. The author does a massive number of the proofs in the book and is fairly good at explaining the subject matter in each chapter. Given that every person learns a little differently, I'd still suggest using online resources to supplement the readings and exercises, especially for practical applications.

I tend to evaluate books to a large extent on whether they're suited to self-study or useful as a supplement. (If you have a course with a required text, you'll have to get it, and reviews won't matter much.) Cullen's book is definitely useful for self-study ... with some caveats. The book is very comprehensive. The author says it's intended for a one-semester course but then qualifies that; the whole book would take two semesters at most universities. The book is also very rigorous. This is great, depending on what you're looking for. If you want no-compromise, thorough learning, you'll get it, but you'll have to work for it. I mean serious work. The book says it has little in the way of prerequisites. That's true in a strict sense, but in fact I think to use this book you need a certain amount of mathematical sophistication. A basic "proofs" book might be a good companion or even a prior study. The author doesn't hold back on formalism and use of notation, and some level of comfort with this is necessary. That doesn't mean the book is overly academic, obscure, or unclear. It's none of those things. But what it does is demand a lot on the part of the student. You absolutely must take the time to learn everything as it's presented. There isn't much in the way of repetition and second chances, although there are detailed examples which are quite helpful. Working the

problems (there are a few solutions given) is also essential, and I'd use one of those Schaum books (or similar) to supplement the problems and examples. The exacting rigor at times obscures practical application; the presentation of determinants, for instance, is not at all what I'm used to--- but that said, it gave me a different and greater level of understanding. If you're looking to study more advanced, abstract math, the first five chapters are crucial and you might want to look at the seventh chapter and maybe some other material. The author gives good suggestions in the introduction. This, of course, is an older book, but it remains very relevant. You can certainly use it for self-study if you use a supplement or two and if you're willing to put in the effort. If you want a light and happy overview that doesn't demand intellectual effort, look elsewhere. If you really want to master the material, consider this book. It isn't a classic text for nothing.

Although published over 40 years ago, this book is well written and organized. The type of information contained in it doesn't expire. My only complaint is that I purchased the Kindle edition and, being replete with equations and mathematical symbols that are tiny images, it is very hard to read because they don't scale with the text. I would recommend purchasing the paper version and not the Kindle version.

I have several books on linear algebra and no two of them attack the topic the same way. This book offers a theoretical bent and covers some of the important theorems not covered in some other texts on the subject.

Tough stuff.

Cullen organizes his material well. The book's sections are short and easy to finish quickly, which gives the reader a satisfying sense of "making progress." He gives clear and careful explanations, including numbered definitions of key concepts. There are also plenty of examples and exercises. For a comprehensive introduction to linear algebra, there's no better book than David C. Lay's *Linear Algebra and Its Applications* (4th Edition). But for an overview or a quick review, this is a better book than Lay. I really like it. (The Lay book has the advantage of being available for the Kindle app on the iPad. The Cullen book isn't. On the other hand, the e-Book version of Lay is slow and clunky, so it's obviously not optimized for the e-Book format.)

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