
An introductory text with lots of short historical notes and introductions to applications of linear algebra, as well as information on numerical issues. The book focuses primarily on $\mathbb{R}^n$. The order of topics is somewhat nonstandard—the notion of dimension first appears in Chapter 7 and the general definition of a vector space does not appear until Chapter 9, the last chapter. There is a companion web site, [http://www.wiley.com/college/anton](http://www.wiley.com/college/anton).


A second course in linear algebra concentrating on real and complex vector spaces, linear maps, and inner product spaces. Its central concern is the structure of a linear operator (a linear map from a vector space to itself). The special feature of this book is that it proves the existence of eigenvalues for linear maps on complex finite-dimensional vector spaces without using determinants. Much thought has gone into this book’s clean, clear proofs. It is a good book for students to read and refer to on their own. The author’s web site, with errata and other information about the book, is [http://www.math.berkeley.edu/~axler](http://www.math.berkeley.edu/~axler).


An introductory text with an unusual and interesting approach to determinants based on a pictorial determination of the sign of a permutation. (The author would call it “counting the inversions of a pattern”.) Cramer’s rule is also interpreted geometrically. Eigenvectors are introduced via linear dynamical systems. There is a home page for the text: [http://www.prenhall.com/bretscher](http://www.prenhall.com/bretscher).


Sophisticated linear algebra text emphasizing canonical forms, multilinear mappings and tensors, and infinite-dimensional vector spaces. No coverage of numerical methods.


This text is intended to provide material for a second one-term linear algebra course, pitched at the senior or first-year graduate level. Written in theorem-proof style, it covers multilinear algebra, canonical forms, normed linear vector spaces, and inner product spaces.


Concise, elegant introduction to linear algebra. A chapter on vectors precedes chapters on systems of equations, matrices, and determinants. These are followed by chapters on coordinate geometry and normal forms of matrices, then applications to algebra, geometry, calculus, mechanics, and economics. Applications include the classification of central quadrics, positivity criteria, simultaneous reduction of two quadratic forms, polar form, linear programming, the Morse lemma, normal modes of vibration, linear differential equations with applications to economics, inversion by iteration, and difference equations.


This is a book on the theory of linear algebra. The only applications are at the end: finite symmetry groups in three dimensions, differential equations, analytic methods in matrix theory, and sums of squares and Hurwitz’s theorem. Curtis includes material on canonical forms, dual vector spaces, multilinear algebra, and the principal axis theorem. The singular value theorem and pseudoinverse are not covered.


The author has used sketches by Norman Steenrod to create a book on real vector spaces (especially $\mathbb{R}^3$) that emphasizes an intuitive geometric approach rather than the usual axiomatic algebraic approach. This text stresses the geometry of linear transformations and regards matrices and determinants as tools for computation rather than as primary objects of study. The role of Lie theory is explained. Complex vector spaces are not covered at all. Unusual approach not found in any other book.


This excellent text is a careful and thorough treatment of linear algebra that briefly covers a number of applications, such as Lagrange interpolation, incidence matrices, Leontief’s model (economics), systems of differential equations, Markov chains and genetics, rigid motions in $\mathbb{R}^2$ and $\mathbb{R}^3$, conic sections, the second derivative test, and Sylvester’s law of inertia. The main emphasis is on theory, including duality and canonical forms, with two sections on Jordan canonical form. A distinguishing feature of this text is that vector spaces and linear transformations are covered before systems of linear equations. The chapter on inner
product spaces is especially rich, with sections on the singular value theorem and pseudoinverse (including
the complex case, which I have not found elsewhere), bilinear and quadratic forms, Einstein’s special
theory of relativity, conditioning and the Rayleigh quotient, and the geometry of orthogonal operators.


This classic text goes much deeper than most books. Volume One includes chapters on functions
of matrices (including representation by series, systems of linear differential equations, and stability),
canonical forms, matrix equations (such as $AX = XB, AX - XB = C$, matrix polynomial equations,
$m^{th}$ roots of matrices, and the logartihm of a matrix), and quadratic and Hermitian forms. Volume Two
covers complex symmetric, skew-symmetric and orthogonal matrices; singular pencils of matrices; matrices
with non-negative elements; applications to systems of linear differential equations; and the problem of
Routh-Hurwitz and related questions.


This text goes beyond eigenvalues and eigenvectors to the classification of bilinear forms, normal matrices,
spectral decompositions, the Jordan canonical form, and sequences and series of matrices.


An elegant and detailed axiomatic treatment of linear algebra, written by a differential geometer. Topics
include duality, oriented vector spaces, algebras, gradations and homology, inner product spaces, quater
nions, rotations of Euclidean spaces of dimensions 2 through 4, differentiable families of linear automor
phisms, symmetric bilinear forms, pseudo-Euclidean spaces and Lorentz transformations, quadrics in affine
and Euclidean space, unitary spaces, polynomial algebras, and structure of linear transformations.


Sequel and companion volume to the author’s *Linear Algebra*. Topics include tensor products, tensor
algebra, exterior algebra, applications to linear transformations, Clifford algebras and their representations.

Now available from Springer.

This is a classic text by a famous analyst and expositor. Its purpose is to treat the theory of linear
transformations on finite-dimensional vector spaces by the methods of more general theories. The book
emphasizes coordinate-free methods. The treatments of matrices and determinants are unusually brief.
The last chapter on analysis discusses convergence of vectors, norms of transformations, a minimax
principle for self-adjoint transformations, convergence of linear transformations, an ergodic theorem by
Riesz, and power series. There is an appendix on Hilbert space.


This introductory text is a blend of interactive computer tutorials and traditional text. It comes with
a CD-ROM containing 30 Maple worksheets and 30 Mathematica notebooks. There are chapters on
systems of linear equations, vectors, matrix algebra, linear transformations, vector spaces, determinants,
eigenvalues and eigenvectors, and orthogonality. Some standard topics are treated briefly in tutorials.
Complex vector spaces and canonical forms are not covered. Applications include curve fitting, estimation
of temperature distribution in a thin plate, Markov chains, cryptology, computer graphics, networks, and
systems of linear differential equations.


Excellent junior/senior-level text. The chapter headings are: linear equations, vector spaces, linear
transformations, polynomials, determinants, elementary canonical forms, the rational and Jordan forms,
inner product spaces, operators on inner product spaces, and bilinear forms. Emphasizes concepts, not
applications or numerical methods. Good exercises.

280 pp.

Middle volume of excellent high-level text on abstract algebra. Can be read independently of first
volume. The chapter headings are: finite dimensional vector spaces, linear transformations, the theory
of a single linear transformation, sets of linear transformations, bilinear forms, Euclidean and unitary
spaces, (tensor) products of vector spaces, the ring of linear transformations, and infinite dimensional
vector spaces. Jacobson drops the assumption that multiplication of scalars is commutative, defining his
vector spaces over a division ring.

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The second edition is a rather abstract text on linear algebra, but the author does explain some geometric concepts. The book is organized into three parts: basic theory, structure theorems, and relations with other structures. The second part includes triangulation (i.e., triangularization) and diagonalization of matrices, primary decomposition, and Jordan normal form. The third part discusses multilinear products, groups, rings, and modules. There are appendices on convex sets, odds and ends (induction, algebraic closure of the complex numbers, and equivalence relations), and angles. The third edition is considerably shorter and is not divided into parts. It omits the first chapter on the geometry of vectors and Appendix 3 on angles, deletes the section on determinants as area and volume, rearranges the chapters and sections of Part Two, and omits part three entirely, but includes a chapter on convex sets (the old Appendix 1) and adds an appendix on the Iwasawa decomposition and others.


Advanced treatment that covers all the standard elementary topics in the first 75 pages or so. Uses quotient spaces. Topics include duality, interpolation, difference equations, law of inertia, Rayleigh quotients, Rellich’s theorem, and avoidance of crossing. Whole chapters on matrix inequalities, kinematics and dynamics, convexity, the duality theorem, normed linear spaces, positive matrices, and numerical solution of linear systems of equations. Appendices on special determinants, Pfaff’s theorem, symplectic matrices, tensor products, lattices, fast matrix multiplication, Gershgorin’s theorem, and the multiplicity of eigenvalues.


This introductory text features brief accounts (with references) of a great variety of applications. There are many MATLAB exercises, supported by an appendix on MATLAB. There is a chapter on numerical linear algebra, and two extra chapters (on iterative methods and Jordan canonical form) are available for downloading from the book’s web page, http://www.prenhall.com/Leon.


This inexpensive text is a good source of numerous solved problems.


This big applied text has broad coverage and emphasizes matrices and numerical aspects of linear algebra algorithms. The LU factorization is covered for square matrices only. Includes a chapter on Perron-Frobenius theory. The CD-ROM contains the entire text and solutions manual in pdf format, plus many extras, such as biographies of mathematicians, the history of mathematical notations, the history of mathematics in China, and articles on numerical linear algebra. Errata, updates, and downloads are available at the text’s website, http://www.matrixanalysis.com/.


Introductory text with brief treatments of many interesting applications, some presented in the form of miniprojects. Contains computer exercises with selected solutions in Maple, MATLAB, and Mathematica.


Fine applied text with many interesting applications and helpful discussion of practical numerical issues. Includes coverage of canonical forms, the singular value decomposition, the pseudoinverse, Rayleigh’s principle and the min-max principle for extremizing quadratic forms, and linear programming, as well as inverses of perturbed matrices.


This applied text has chapters on linear algebraic systems, vector spaces and bases, inner products and norms, minimization and least squares approximation, orthogonality, equilibrium, linearity, eigenvalues, linear dynamical systems, iteration of linear systems, and boundary value problems in one dimension. The depth and variety of its applications exceed those of most texts. Its philosophy is that of Strang’s text *Linear Algebra and its Applications*, but it covers more topics. The last chapter introduces generalized functions and infinite-dimensional function space methods. The book’s website, http://www.math.umn.edu/~olver/ala.html, contains errata and MATLAB programs.

Large introductory text emphasizing geometry, applications, and technology. Explorations and applications include error-detecting codes, LU factorization for square matrices, Markov chains, Leslie’s model of population growth, graphs and digraphs, error-correcting codes, iterative methods for computing eigenvalues, the Perron-Frobenius theorem, linear recurrence relations, systems of linear differential equations, the modified QR factorization, dual codes, quadratic forms and graphs of quadratic equations in two and three variables, tilings of the plane, linear codes, taxicab geometry, and approximation of functions. Comes with CD-ROM containing data sets and manuals for using Maple, MATLAB, and Mathematica. The book’s website, http://math.brookscole.com/poolelinearalgebra, contains support materials for students and instructors.


This intriguing book is filled with interesting results on finite-dimensional vector spaces, mostly real or complex, that are hard to find elsewhere. It has chapters on determinants, linear spaces, canonical forms of matrices and linear operators, matrices of special form, multilinear algebra, matrix inequalities, and matrices in algebra and calculus. Computational linear algebra is not treated. Most essential results of linear algebra appear here, often with nonstandard neat proofs. Solutions to all the problems are included.


Written from the point of view of physics and engineering, this book emphasizes one important aspect of linear algebra, the diagonalization (or decoupling) of matrices and linear operators. It is designed as a text for a second course in linear algebra for juniors and seniors. Chapters on crucial applications (discrete-time evolution, first- and second-order continuous-time evolution, Markov chains and probability matrices, linear analysis near fixed points of nonlinear problems), the wave equation, continuous spectra and the Dirac delta function, Fourier transforms, and Green’s functions.


This is a well-written introductory text with some unusual features. It contains historical notes at the end of each chapter and covers some nonstandard topics such as Lagrange interpolation, Jordan canonical form, isometries of \( \mathbb{R}^n \) (for \( n = 1, 2, \) and 3), and perspective projections. Roughly comparable to Strang’s Introduction to Linear Algebra, but with more emphasis on definitions and proofs and less on numerical linear algebra. Contains a short annotated bibliography.


Somewhat lower in level than Strang’s Linear Algebra and its Applications, this introductory text covers the same topics in less detail and its exercises are more elementary. The text is supported by an MIT course web site, http://web.mit.edu/18.06/www, and an OpenCourseWare site, http://ocw.mit.edu. The web sites offer MATLAB “teaching codes”, interactive Java demos, and videos of Strang’s lectures. Useful items at the back of the text include a sample final exam, a two-page summary of matrix factorizations, conceptual questions for review, a glossary, a list of the MATLAB teaching codes, and a table called “Linear Algebra in a Nutshell” that lists many ways of distinguishing nonsingular square matrices from singular ones.


Excellent text on real and complex matrices and their applications, with chapters on matrices and Gaussian elimination, vector spaces, orthogonality, determinants, eigenvalues and eigenvectors, positive definite matrices, computations with matrices, and linear programming and game theory. Discusses the singular value decomposition, the pseudoinverse, the fast Fourier transform, Rayleigh’s quotient and the minimax principle, the finite element method, and numerical methods. There are appendices on the intersection, sum, and product of spaces and on Jordan form. This book is the standard against which modern texts on applied linear algebra are judged. The text is supported by an MIT course web site, http://web.mit.edu/18.06/www, and an OpenCourseWare site, http://ocw.mit.edu. The web sites offer MATLAB “teaching codes”, interactive Java demos, and videos of Strang’s lectures.


This book is intended to serve as the main text for a traditional course in linear algebra, enriched and facilitated using Maple V or Maple 6. (Note: As of this writing, the latest version of Maple is Maple 9, but most of the material in this book is still current.) Often examples are solved using three methods: the finalg package of Maple V, the LinearAlgebra package of Maple 6, and ordinary pencil and paper.
calculation. It uses standard mathematical notation, but also incorporates Maple code throughout. There is an appendix on Maple packages, as well as a long and helpful answer section that includes many Maple-based solutions.


This text is organized around the idea of a linear transformation. An account of the philosophy underlying the text can be found at http://www.auburn.edu/~uhligfd/TLA/download/tlateach.pdf. Each of the fourteen chapters starts with a fundamental lecture, usually followed by sections on theory and applications. There is enough material for a year-long course. The fourteenth chapter, on nondiagonalizable matrices, is posted on the web at http://www.auburn.edu/~uhligfd/TLA/download/C14.pdf. There is also an Appendix D on inner products at http://www.auburn.edu/~uhligfd/TLA/download/AIPS.pdf. The text is organized so that eigenvalues and eigenvectors can be covered without determinants (as in Axler’s book), with determinants, or (for purposes of comparison) in both ways.


This text integrates mathematics and computation with a wide variety of applications. Browsing through the applications gives one a real appreciation for the usefulness of linear algebra. Manuals for the use of calculators (TI-82/83) and MATLAB are included as appendices. Useful MATLAB m-files are available at http://www.stetson.edu/~gwilliam/mfiles.htm.

**OTHER LISTS.** The Mathematical Association of America maintains a basic library list of books on various mathematical topics at http://www.maa.org/BLL/TOC.htm. It organizes the books by level and gives them star ratings, but there are no annotations. The list was last updated in 1992. The linear algebra list is at http://www.maa.org/BLL/linearalgebra.htm.

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