

Anton, Howard and Busby, Robert C., *Contemporary Linear Algebra*, Wiley, 2003, xviii + 633 pp.

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>.

Axler, Sheldon, *Linear Algebra Done Right* (Second Edition), Springer-Verlag, 1997, paperback, xv + 251 pp. Corrected printing, 2004.

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://math.sfsu.edu/axler>.

Banchoff, Thomas and Wermer, John, *Linear Algebra Through Geometry*, Springer-Verlag, 1983, x + 257 pp.

An elementary linear algebra text emphasizing vector geometry and transformations in two, three, and four dimensions. Applications include classification of conic sections and quadric surfaces, systems of differential equations (which the authors call “differential systems”).

Blyth, T. S. and Robertson, E. F., *Basic Linear Algebra* (Second Edition), Springer, 2002, x + 232 pp.

The authors' goal is to present a reasonably compact and readable, but rigorous, first course in linear algebra. The first four chapters concentrate on matrices and systems of linear equations. Then the authors generalize the setting to vector spaces and linear mappings.

Blyth, T. S. and Robertson, E. F., *Further Linear Algebra*, Springer, 2002, ii + 230 pp.

This is a continuation of the authors' *Basic Linear Algebra*, covering primary decomposition, triangular form, Jordan form, rational form, duality, and bilinear and quadratic forms.

Bretscher, Otto, *Linear Algebra with Applications* (Fourth Edition), Prentice Hall, 2009, xv + 478 pp.

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://prenhall.com/bretscher>.

Broida, Joel G. and Williamson, S. Gill, *A Comprehensive Introduction to Linear Algebra*, Addison-Wesley, 1989, xiv + 734 pp.

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

Brown, William C., *A Second Course in Linear Algebra*, Wiley, 1988, x + 264 pp.

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.

Cohn, Paul M., *Elements of Linear Algebra*, Chapman & Hall, 1994, paperback, xiii + 226 pp.

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.

Curtis, Charles W., *Linear Algebra: An Introductory Approach* (Fourth Edition), Springer Verlag, 1984, xvii + 347 pp.

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.

Curtis, Morton L. and Place, Paul, *Abstract Linear Algebra*, Springer, 1990, x + 168 pp.

This short but sophisticated introduction to linear algebra culminates in an elementary proof of Hurwitz' Theorem, which says that the only normed algebras over the real numbers are the real numbers, the complex numbers, the quaternions, and the octonions (sometimes called the Cayley numbers). Determinants

are treated via exterior algebras and the Cayley-Hamilton Theorem is proved in a general setting. The text also covers duality, the Spectral Theorem, Jordan form, inner products, bilinear forms, and stable spaces for orthogonal and unitary groups.

Fekete, Antal E., *Real Linear Algebra*, Marcel Dekker, 1985, xxi + 426 pp.

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.

Friedberg, Stephen H., Insel, Arnold J., and Spence, Lawrence E., *Linear Algebra* (Fourth Edition), Prentice Hall, 2003, xii + 601 pp.

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.

Gantmacher, F. R., *The Theory of Matrices* (2 volumes), Chelsea. Volume One: ©1959, 1960, and 1977, x + 374 pp.; Volume Two: ©1959 and 1960, ix + 276 pp. English translation of the original Russian book.

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,  $m^{\text{th}}$  roots of matrices, and the logarithm 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.

Gilbert, Jimmie and Gilbert, Linda, *Linear Algebra and Matrix Theory* (Second Edition), Thomson Brooks/Cole, 2004, ix + 518 pp.

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.

Golan, Jonathan S., *The Linear Algebra a Beginning Graduate Student Ought to Know* (Second Edition), Springer, 2007, xi + 435 pp.

This book is intended to serve as a self-study guide, a text for a course in advanced linear algebra at the upper undergraduate or first year graduate level, or reference book. The author also suggests using it to prepare for prelim or PhD qualifying exams. It includes an intimidating collection of almost 1100 exercises, many of them quite challenging, but no solutions, hints, or answers are provided. There are many thumbnail photographs of mathematicians who have contributed to the development of material presented in the book. I find the book readable, but although many of the chapters are quite long, they must be swallowed whole, as they are not divided into sections. In my opinion, the book would benefit greatly from a summary of the contents of each chapter. The chapter titles are Notation and terminology, Fields, Vector spaces over a field, Algebras over a field, Linear independence and dimension, Linear transformations, The endomorphism algebra of a vector space, Representation of linear transformations by matrices, The algebra of square matrices, Systems of linear equations, Determinants, Eigenvalues and eigenvectors, Krylov subspaces, The dual space, Inner product spaces, Orthogonality, Selfadjoint endomorphisms, Unitary and normal endomorphisms, Moore-Penrose pseudoinverses, and Bilinear transformations and forms.

Greub, Werner, *Linear Algebra* (Fourth Edition, 2nd revised printing), Springer-Verlag, 1981, Graduate Texts in Mathematics 23, xvii + 451 pp.

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, quaternions, rotations of Euclidean spaces of dimensions 2 through 4, differentiable families of linear automorphisms, symmetric bilinear forms, pseudo-Euclidean spaces and Lorentz transformations, quadrics in affine and Euclidean space, unitary spaces, polynomial algebras, and structure of linear transformations.

Greub, Werner, *Multilinear Algebra* (Second Edition), Springer-Verlag, 1978, paperback, vii + 294 pp.

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.

Halmos, Paul R., *Finite-Dimensional Vector Spaces* (Second Edition), van Nostrand, 1958, viii + 200 pp. 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.

Herman, Eugene A. and Pepe, Michael D., *Visual Linear Algebra*, Wiley, 2005, xix + 550 pp.

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.

Hoffman, Kenneth & Kunze, Ray, *Linear Algebra* (Second Edition), Prentice-Hall, 1971, viii + 407 pp.

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.

Jacobson, Nathan, *Lectures in Abstract Algebra* (Volume II—Linear Algebra), Van Nostrand, 1953, xii + 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.

Lang, Serge, *Linear Algebra* (Second Edition), Addison Wesley, 1971, xi + 400 pp. Third Edition, Springer Verlag, 1987, ix + 296 pp.

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.

Lax, Peter D., *Linear Algebra and Its Applications* (Second Edition), Wiley, 2007, xv + 376 pp.

Advanced treatment that covers all the standard elementary topics in the first 85 pages or so. This text is intended for a second course in linear algebra, at the senior level. 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, numerical solution of linear systems of equations, and calculation of eigenvalues of self-adjoint matrices. Appendices on special determinants, Pfaff's theorem, symplectic matrices, tensor products, lattices, fast matrix multiplication, Gershgorin's theorem, the multiplicity of eigenvalues, fast Fourier transforms, the spectral radius, the Lorentz group, compactness of the unit ball, a characterization of commutators, Liapunov's Theorem, Jordan canonical form, and the numerical range of a linear operator.

Lay, David C., *Linear Algebra and Its Applications* (Fourth Edition), Addison-Wesley, 2012, xvi + 558 pp.

This is a well written introduction to the linear algebra of real vector spaces that does a good job of describing many applications of the subject. The chapter on symmetric matrices and quadratic forms includes coverage of the singular value decomposition. The geometry of vector spaces is treated in detail, and chapters on optimization and finite-state Markov chains are provided online at [www.pearsonhighered.com/irc](http://www.pearsonhighered.com/irc).

Leon, Stephen J., *Linear Algebra with Applications* (Eighth Edition), Prentice Hall, 2010, xiv + 490 pp.

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 canonical forms) are available for downloading from the book's web page, [www.pearsonhighered.com/leon](http://www.pearsonhighered.com/leon).

Lin, I-hsiung, *Geometric Linear Algebra*, Volume 1, World Scientific, xxiii + 856 pp.

A long and leisurely introduction to linear algebra, emphasizing the affine and linear structures of  $\mathbb{R}^1$ ,  $\mathbb{R}^2$ , and  $\mathbb{R}^3$ . This accessible book for beginners uses intuitive geometric concepts to create abstract algebraic theory with a special emphasis on geometric characterizations.

Lipschutz, Seymour, *Theory and Problems of Linear Algebra* (Second Edition), Schaum's Outline Series, McGraw-Hill, 1991, paperback, vii + 453 pp.

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

Meyer, Carl D., *Matrix Analysis and Applied Linear Algebra*, siam (Society for Industrial and Applied Mathematics), 2000, xii + 718 pp., includes a multiplatform CD-ROM.

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/>.

Nakos, George and Joyner, David, *Linear Algebra with Applications*, Brooks/Cole, 1998, xviii + 666 pp.

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.

Noble, Ben and Daniel, James W., *Applied Linear Algebra* (Third Edition), Prentice Hall, 1988, xvi + 521 pp.

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.

Olver, Peter J. and Shakiban, Chehrzad, *Applied Linear Algebra*, Pearson Prentice Hall, 2006, xxii + 714 pp.

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.

Poole, David, *Linear Algebra: A Modern Introduction* (Third Edition), Brooks/Cole, Cengage Learning, 2011, xxiv + 726 pp.

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. The book's website, <http://www.cengage.com/math/poole>, contains support materials for students and instructors.

Prasolov, Viktor Vasilevich, *Problems and Theorems in Linear algebra*, Translations of Mathematical Monographs, Volume 134, American Mathematical Society, 1994, paperback, xviii + 229 pp.

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.

Robbiano, Lorenzo, *Linear Algebra for Everyone*, Springer, 2011, xvii + 218 pp.

This is an engaging, light-hearted introduction to linear algebra that strives for informality and uses motivating applications to communicate the material effectively. Part I deals with systems of linear equations and matrices, including the LU decomposition and vector geometry. Part II covers quadratic forms and orthogonality, including the QR decomposition, least squares, pseudo-inverses, and diagonalization by use of eigenvalues and eigenvectors. The appendix discusses the use of the computer software package CoCoA.

Roman, Steven, *Advanced Linear Algebra* (Third Edition), Springer, 2008, xviii + 522pp.

This book is a thorough introduction to linear algebra for graduate students or advanced undergraduate students. A sophomore course in linear algebra is in my opinion a necessary prerequisite for reading this book since a knowledge of basic properties of matrices and determinants, including the uniqueness of row reduced echelon form, is assumed. Topics covered include isomorphism theorems, duality, the theory of modules (including modules over a principal ideal domain), rational and Jordan canonical forms, structure theory for normal operators, bilinear forms, metric and Hilbert spaces, tensor products, convexity and positive solutions to linear systems, affine geometry, singular values and the Moore-Penrose pseudoinverse, associative algebras, and the umbral calculus.

Sadun, Lorenzo, *Applied Linear Algebra: The Decoupling Principle*, Prentice Hall, 2001, xvii + 349 pp.

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.

Shifrin, Theodore and Adams, Malcolm R., *Linear Algebra: A Geometric Approach*, Freeman, 2002, xviii + 439 pp.

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.

Shores, Thomas S., *Applied Linear Algebra and Matrix Analysis*, Springer, 2007, xii + 383 pp.

This is an elementary text with a strong orientation toward numerical computation and applied mathematics. It is designed to help with incorporating mathematical experimentation into the class through the use of computer technology. The author encourages students to produce written reports to express their mathematical ideas and also promotes team projects as a vehicle for cooperative learning. Each chapter ends with an optional section consisting of computational notes and projects. Optional topics include tensor products of matrices, change of basis, operator norms, the Schur triangularization theorem, and the singular value decomposition. Reader tasks at increasing levels of sophistication include exercises, problems, projects, and reports. The author maintains a web page of project notebooks, supplementary exercises, errata, etc. at <http://www.math.unl.edu/~tshores1/mylinalg.html>.

Strang, Gilbert, *An Introduction to Linear Algebra* (Fourth Edition), Wellesley-Cambridge Press, 2003, ix + 574 pp.

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 its own website, <http://ocw.mit.edu>, an MIT course web site, <http://web.mit.edu/18.06>, 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 solutions to selected exercises, conceptual questions for review, a glossary, a list of matrix factorizations, 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.

Strang, Gilbert, *Linear Algebra and its Applications* (Fourth Edition), Thomson Brooks/Cole, 2009, viii + 488 pp.

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.

Szabo, Fred, *Linear Algebra: An Introduction Using Maple*<sup>®</sup>, Harcourt/Academic Press, 2002, xxiii + 788 pp.

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 **linalg** 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.

Uhlig, Frank, *Transform Linear Algebra*, Prentice Hall, 2002, xviii + 503 pp.

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.

Williams, Gareth, *Linear Algebra with Applications* (Seventh Edition), Jones and Bartlett, 2011, xxi + 554 pp.

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-83/83+) 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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