

Linear Algebra Ideas And Applications Richard Penney

This book develops the Weyr matrix canonical form, a largely unknown cousin of the Jordan form. It explores novel applications, including include matrix commutativity problems, approximate simultaneous diagonalization, and algebraic geometry. Module theory and algebraic geometry are employed but with self-contained accounts.

An introduction to the basic concepts of linear algebra, along with an introduction to the techniques of formal mathematics. Numerous worked examples and exercises, along with precise statements of definitions and complete proofs of every theorem, make the text ideal for independent study.

This text for a second course in linear algebra, aimed at math majors and graduates, adopts a novel approach by banishing determinants to the end of the book and focusing on understanding the structure of linear operators on vector spaces. The author has taken unusual care to motivate concepts and to simplify proofs. For example, the book presents - without having defined determinants - a clean proof that every linear operator on a finite-dimensional complex vector space has an eigenvalue. The book starts by discussing vector spaces, linear independence, span, basics, and dimension. Students are introduced to inner-product spaces in the first half of the book and shortly thereafter to the finite-dimensional spectral theorem. A variety of interesting exercises in each chapter helps students understand and manipulate the objects of linear algebra. This second edition features new chapters on diagonal matrices, on linear functionals and adjoints, and on the spectral theorem; some sections, such as those on self-adjoint and normal operators, have been entirely rewritten; and hundreds of minor improvements have been made throughout the text. Holt's Linear Algebra with Applications, Second Edition, blends computational and conceptual topics throughout to prepare students for the rigors of conceptual thinking in an abstract setting. The early treatment of conceptual topics in the context of Euclidean space gives students more time, and a familiar setting, in which to absorb them. This organization also makes it possible to treat eigenvalues and eigenvectors earlier than in most texts. Abstract vector spaces are introduced later, once students have developed a solid conceptual foundation. Concepts and topics are frequently accompanied by applications to provide context and motivation. Because many students learn by example, Linear Algebra with Applications provides a large number of representative examples, over and above those used to introduce topics. The text also has over 2500 exercises, covering computational and conceptual topics over a range of difficulty levels.

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

This book provides an elementary analytically inclined journey to a fundamental result of linear algebra: the Singular Value Decomposition (SVD). SVD is a workhorse in many applications of linear algebra to data science. Four important applications relevant to data science are considered throughout the book: determining the subspace that "best" approximates a given set (dimension reduction of a data set); finding the "best" lower rank approximation of a given matrix (compression and general approximation problems); the Moore-Penrose pseudo-inverse (relevant to solving least squares problems); and the orthogonal Procrustes problem (finding the orthogonal transformation that most closely transforms a given collection to a given configuration), as well as its orientation-preserving version. The point of view throughout is analytic. Readers are assumed to have had a rigorous introduction to sequences and continuity. These are generalized and applied to linear algebraic ideas. Along the way to the SVD, several important results relevant to a wide variety of fields (including random matrices and spectral graph theory) are explored: the Spectral Theorem; minimax characterizations of eigenvalues; and eigenvalue inequalities. By combining analytic and linear algebraic ideas, readers see seemingly disparate areas interacting in beautiful and applicable ways.

Praise for the Third Edition "This volume is ground-breaking in terms of mathematical texts in that it does not teach from a detached perspective, but instead, looks to show students that competent mathematicians bring an intuitive understanding to the subject rather than just a master of applications." - Electric Review Learn foundational and advanced topics in linear algebra with this concise and approachable resource A comprehensive introduction, Linear Algebra: Ideas and Applications, Fifth Edition provides a discussion of the theory and applications of linear algebra that blends abstract and computational concepts. With a focus on the development of mathematical intuition, the book emphasizes the need to understand both the applications of a particular technique and the mathematical ideas underlying the technique. The book introduces each new concept in the context of explicit numerical examples, which allows the abstract concepts to grow organically out of the necessity to solve specific problems. The intuitive discussions are consistently followed by rigorous statements of results and proofs. Linear Algebra: Ideas and Applications, Fifth Edition also features: A new application section on section on Google's Page Rank Algorithm. A new application section on pricing long term health insurance at a Continuing Care Retirement Community (CCRC). Many other illuminating applications of linear algebra with self-study questions for additional study. End-of-chapter summaries and sections with true-false questions to aid readers with further comprehension of the presented material Numerous computer exercises

throughout using MATLAB® code Linear Algebra: Ideas and Applications, Fifth Edition is an excellent undergraduate-level textbook for one or two semester undergraduate courses in mathematics, science, computer science, and engineering. With an emphasis on intuition development, the book is also an ideal self-study reference.

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This is an introductory textbook designed for undergraduate mathematics majors with an emphasis on abstraction and in particular, the concept of proofs in the setting of linear algebra. Typically such a student would have taken calculus, though the only prerequisite is suitable mathematical grounding. The purpose of this book is to bridge the gap between the more conceptual and computational oriented undergraduate classes to the more abstract oriented classes. The book begins with systems of linear equations and complex numbers, then relates these to the abstract notion of linear maps on finite-dimensional vector spaces, and covers diagonalization, eigenspaces, determinants, and the Spectral Theorem. Each chapter concludes with both proof-writing and computational exercises.

This new book offers a fresh approach to matrix and linear algebra by providing a balanced blend of applications, theory, and computation, while highlighting their interdependence. Intended for a one-semester course, Applied Linear Algebra and Matrix Analysis places special emphasis on linear algebra as an experimental science, with numerous examples, computer exercises, and projects. While the flavor is heavily computational and experimental, the text is independent of specific hardware or software platforms. Throughout the book, significant motivating examples are woven into the text, and each section ends with a set of exercises.

Updated and revised to increase clarity and further improve student learning, the Eighth Edition of Gareth Williams' classic text is designed for the introductory course in linear algebra. It provides a flexible blend of theory and engaging applications for students within engineering, science, mathematics, business management, and physics. It is organized into three parts that contain core and optional sections. There is then ample time for the instructor to select the material that gives the course the desired flavor. Part 1 introduces the basics, presenting systems of linear equations, vectors and subspaces of \mathbb{R}^n , matrices, linear transformations, determinants, and eigenvectors. Part 2 builds on the material presented in Part 1 and goes on to introduce the concepts of general vector spaces, discussing properties of bases, developing the rank/nullity theorem, and introducing spaces of matrices and functions. Part 3 completes the course with important ideas and methods of numerical linear algebra, such as ill-conditioning, pivoting, and LU decomposition. Throughout the text the author takes care to fully and clearly develop the mathematical concepts and provide modern applications to reinforce those concepts. The applications range from theoretical applications within differential equations and least square analysis, to practical applications in fields such as archeology, demography, electrical engineering and more. New exercises can be found throughout that tie back to the modern examples in the text. Key Features of the Eighth Edition:

- Updated and revised throughout with new section material and exercises.
- Each section begins with a motivating introduction, which ties material to the previously learned topics.
- Carefully explained examples illustrate key concepts throughout the text.
- Includes such new topics such as QR Factorization and Singular Value Decomposition.
- Includes new applications such as a Leslie Matrix model that is used to predict birth and death patterns of animals.
- Includes discussions of the role of linear algebra in many areas, such as the operation of the search engine Google and the global structure of the worldwide air transportation network.
- A MATLAB manual that ties into the regular course material is included as an appendix. These ideas can be implemented on any matrix algebra software package. This manual consists of 28 sections that tie into the regular course material.
- Graphing Calculator Manual included as an appendix.
- A Student Solutions Manual that contains solutions to selected exercises is available as a supplement. An Instructors Complete Solutions Manual, test bank, and PowerPoint Lecture Outlines are also available.
- Available with WebAssign Online Homework & Assessment

Linear Algebra: A First Course with Applications explores the fundamental ideas of linear algebra, including vector spaces, subspaces, basis, span, linear independence, linear transformation, eigenvalues, and eigenvectors, as well as a variety of applications, from inventories to graphics to Google's PageRank. Unlike other texts on the subject, this classroom-tested book gives students enough time to absorb the material by focusing on vector spaces early on and using computational sections as numerical interludes. It offers introductions to Maple™, MATLAB®, and TI-83 Plus for calculating matrix inverses, determinants, eigenvalues, and eigenvectors. Moving from the specific to the general, the author raises questions, provides motivation, and discusses strategy before presenting answers. Discussions of motivation and strategy include content and context to help students learn.

Linear Algebra Ideas and Applications John Wiley & Sons

Matrix Analysis and Applied Linear Algebra is an honest math text that circumvents the traditional definition-theorem-proof format that has bored students in the past. Meyer uses a fresh approach to introduce a variety of problems and examples ranging from the elementary to the challenging and from simple applications to discovery problems. The focus on applications is a big difference between this book and others. Meyer's book is more rigorous and goes into more depth than some. He includes some of the more contemporary topics of applied linear algebra which are not normally found in undergraduate textbooks. Modern concepts and notation are used to introduce the various aspects of linear equations, leading readers easily to numerical computations and applications. The theoretical developments are always accompanied with examples, which are worked out in detail. Each section ends with a large number of carefully chosen exercises from which the students can gain further insight.

A student-oriented approach to linear algebra, now in its Second Edition This introductory-level linear algebra text is for students who require a clear understanding of key algebraic concepts and their applications in such fields as science, engineering, and computer science. The text utilizes a parallel structure that introduces abstract concepts such as linear transformations, eigenvalues, vector spaces, and orthogonality in

tandem with computational skills, thereby demonstrating clear and immediate relations between theory and application. Important features of the Second Edition include: Gradual development of vector spaces Highly readable proofs Conceptual exercises Applications sections for self-study Early orthogonality option Numerous computer projects using MATLAB and Maple

A groundbreaking introduction to vectors, matrices, and least squares for engineering applications, offering a wealth of practical examples. This textbook emphasizes the interplay between algebra and geometry to motivate the study of linear algebra. Matrices and linear transformations are presented as two sides of the same coin, with their connection motivating inquiry throughout the book. By focusing on this interface, the author offers a conceptual appreciation of the mathematics that is at the heart of further theory and applications. Those continuing to a second course in linear algebra will appreciate the companion volume *Advanced Linear and Matrix Algebra*. Starting with an introduction to vectors, matrices, and linear transformations, the book focuses on building a geometric intuition of what these tools represent. Linear systems offer a powerful application of the ideas seen so far, and lead onto the introduction of subspaces, linear independence, bases, and rank. Investigation then focuses on the algebraic properties of matrices that illuminate the geometry of the linear transformations that they represent. Determinants, eigenvalues, and eigenvectors all benefit from this geometric viewpoint. Throughout, "Extra Topic" sections augment the core content with a wide range of ideas and applications, from linear programming, to power iteration and linear recurrence relations. Exercises of all levels accompany each section, including many designed to be tackled using computer software. *Introduction to Linear and Matrix Algebra* is ideal for an introductory proof-based linear algebra course. The engaging color presentation and frequent marginal notes showcase the author's visual approach. Students are assumed to have completed one or two university-level mathematics courses, though calculus is not an explicit requirement. Instructors will appreciate the ample opportunities to choose topics that align with the needs of each classroom, and the online homework sets that are available through WeBWorK.

Linear algebra permeates mathematics, as well as physics and engineering. In this text for junior and senior undergraduates, Sadun treats diagonalization as a central tool in solving complicated problems in these subjects by reducing coupled linear evolution problems to a sequence of simpler decoupled problems. This is the Decoupling Principle. Traditionally, difference equations, Markov chains, coupled oscillators, Fourier series, the wave equation, the Schrodinger equation, and Fourier transforms are treated separately, often in different courses. Here, they are treated as particular instances of the decoupling principle, and their solutions are remarkably similar. By understanding this general principle and the many applications given in the book, students will be able to recognize it and to apply it in many other settings. Sadun includes some topics relating to infinite-dimensional spaces. He does not present a general theory, but enough so as to apply the decoupling principle to the wave equation, leading to Fourier series and the Fourier transform. The second edition contains a series of Explorations. Most are numerical labs in which the reader is asked to use standard computer software to look deeper into the subject. Some explorations are theoretical, for instance, relating linear algebra to quantum mechanics. There is also an appendix reviewing basic matrix operations and another with solutions to a third of the exercises.

NOTE: This edition features the same content as the traditional text in a convenient, three-hole-punched, loose-leaf version. Books a la Carte also offer a great value--this format costs significantly less than a new textbook. Before purchasing, check with your instructor or review your course syllabus to ensure that you select the correct ISBN. Several versions of Pearson's MyLab & Mastering products exist for each title, including customized versions for individual schools, and registrations are not transferable. In addition, you may need a CourseID, provided by your instructor, to register for and use Pearson's MyLab & Mastering products. xxxxxxxxxxxxxxxx For courses in linear algebra. This package includes MyMathLab(R). With traditional linear algebra texts, the course is relatively easy for students during the early stages as material is presented in a familiar, concrete setting. However, when abstract concepts are introduced, students often hit a wall. Instructors seem to agree that certain concepts (such as linear independence, spanning, subspace, vector space, and linear transformations) are not easily understood and require time to assimilate. These concepts are fundamental to the study of linear algebra, so students' understanding of them is vital to mastering the subject. This text makes these concepts more accessible by introducing them early in a familiar, concrete "Rn" setting, developing them gradually, and returning to them throughout the text so that when they are discussed in the abstract, students are readily able to understand. Personalize learning with MyMathLab MyMathLab is an online homework, tutorial, and assessment program designed to work with this text to engage students and improve results. MyMathLab includes assignable algorithmic exercises, the complete eBook, interactive figures, tools to personalize learning, and more.

Linear Algebra for the Young Mathematician is a careful, thorough, and rigorous introduction to linear algebra. It adopts a conceptual point of view, focusing on the notions of vector spaces and linear transformations, and it takes pains to provide proofs that bring out the essential ideas of the subject. It begins at the beginning, assuming no prior knowledge of the subject, but goes quite far, and it includes many topics not usually treated in introductory linear algebra texts, such as Jordan canonical form and the spectral theorem. While it concentrates on the finite-dimensional case, it treats the infinite-dimensional case as well. The book illustrates the centrality of linear algebra by providing numerous examples of its application within mathematics. It contains a wide variety of both conceptual and computational exercises at all levels, from the relatively straightforward to the quite challenging. Readers of this book will not only come away with the knowledge that the results of linear algebra are true, but also with a deep understanding of why they are true.

The set includes *Linear Algebra: Ideas and Applications*, 4th Edition and *Solutions Manual to Accompany Linear Algebra: Ideas and Applications*, 4th Edition. A unified introduction to linear algebra that reinforces and emphasizes a conceptual and hands-on understanding of the essential ideas. Promoting the development of intuition rather than the simple application of methods, this book successfully helps readers to understand not only how to implement a technique, but why its use is important. In addition, the author outlines an analytical, algebraic, and geometric discussion of the provided definitions, theorems, and proofs. For each concept, an abstract foundation is presented together with its computational output, and this parallel structure clearly and immediately illustrates the relationship between the theory and its appropriate applications. The Fourth Edition features new coverage on orthogonal wavelets, which is a cutting edge application of linear algebra that has only become prominent within the last 10 years. The Student Solutions Manual contains solutions to the odd numbered problems and is available to further aid in reader comprehension, and an Instructor's Solutions Manual (inclusive of suggested syllabi) is available via written request to the Publisher. Both the Student and Instructor Manuals also have been enhanced with further discussions of the applications sections, which is ideal for readers who wish to obtain a deeper knowledge than that provided by pure algorithmic approaches. A related website houses the referenced MATLAB code as well as full-color images of select figures.

This Student Solutions Manual to Accompany Linear Algebra: Ideas and Applications, Fourth Edition contains solutions to the odd numbered problems to further aid in reader comprehension, and an Instructor's Solutions Manual (inclusive of suggested syllabi) is available via written request to the Publisher. Both the Student and Instructor Manuals have been enhanced with further discussions of the applications sections, which is ideal for readers who wish to obtain a deeper knowledge than that provided by pure algorithmic approaches. Linear Algebra: Ideas and Applications, Fourth Edition provides a unified introduction to linear algebra while reinforcing and emphasizing a conceptual and hands-on understanding of the essential ideas. Promoting the development of intuition rather than the simple application of methods, this book successfully helps readers to understand not only how to implement a technique, but why its use is important.

This short but rigorous book approaches the main ideas of linear algebra through carefully selected examples and relevant applications. It is intended for students with various interests in mathematics, as well as established scientists seeking to refresh their basic mathematical culture. The book is also a good introduction to functional analysis and quantum theory since it discusses the general principles of linear algebra without finiteness assumptions.

Part of the new Digital Filmmaker Series! Digital Filmmaking: An Introduction is the first book in the new Digital Filmmaker Series. Designed for an introductory level course in digital filmmaking, it is intended for anyone who has an interest in telling stories with pictures and sound and won't assume any familiarity with equipment or concepts on the part of the student. In addition to the basics of shooting and editing, different story forms are introduced from documentary and live events through fictional narratives. Each of the topics is covered in enough depth to allow anyone with a camera and a computer to begin creating visual projects of quality.

To learn and understand mathematics, students must engage in the process of doing mathematics. Emphasizing active learning, Abstract Algebra: An Inquiry-Based Approach not only teaches abstract algebra but also provides a deeper understanding of what mathematics is, how it is done, and how mathematicians think. The book can be used in both rings-first and groups-first abstract algebra courses. Numerous activities, examples, and exercises illustrate the definitions, theorems, and concepts. Through this engaging learning process, students discover new ideas and develop the necessary communication skills and rigor to understand and apply concepts from abstract algebra. In addition to the activities and exercises, each chapter includes a short discussion of the connections among topics in ring theory and group theory. These discussions help students see the relationships between the two main types of algebraic objects studied throughout the text. Encouraging students to do mathematics and be more than passive learners, this text shows students that the way mathematics is developed is often different than how it is presented; that definitions, theorems, and proofs do not simply appear fully formed in the minds of mathematicians; that mathematical ideas are highly interconnected; and that even in a field like abstract algebra, there is a considerable amount of intuition to be found.

Clear prose, tight organization, and a wealth of examples and computational techniques make Basic Matrix Algebra with Algorithms and Applications an outstanding introduction to linear algebra. The author designed this treatment specifically for freshman majors in mathematical subjects and upper-level students in natural resources, the social sciences, business, or any discipline that eventually requires an understanding of linear models. With extreme pedagogical clarity that avoids abstraction wherever possible, the author emphasizes minimal polynomials and their computation using a Krylov algorithm. The presentation is highly visual and relies heavily on work with a graphing calculator to allow readers to focus on concepts and techniques rather than on tedious arithmetic. Supporting materials, including test preparation Maple worksheets, are available for download from the Internet. This unassuming but insightful and remarkably original treatment is organized into bite-sized, clearly stated objectives. It goes well beyond the LACSG recommendations for a first course while still implementing their philosophy and core material. Classroom tested with great success, it prepares readers well for the more advanced studies their fields ultimately will require. A second course in linear algebra for undergraduates in mathematics, computer science, physics, statistics, and the biological sciences.

Rooted in a pedagogically successful problem-solving approach to linear algebra, the present work fills a gap in the literature that is sharply divided between elementary texts and books that are too advanced to appeal to a wide audience. It clearly develops the theoretical foundations of vector spaces, linear equations, matrix algebra, eigenvectors, and orthogonality, while simultaneously emphasizing applications and connections to fields such as biology, economics, computer graphics, electrical engineering, cryptography, and political science. Ideal as an introduction to linear algebra, the extensive exercises and well-chosen applications also make this text suitable for advanced courses at the junior or senior undergraduate level. Furthermore, it can serve as a colorful supplementary problem book, reference, or self-study manual for professional scientists and mathematicians. Complete with bibliography and index, "Essential Linear Algebra with Applications" is a natural bridge between pure and applied mathematics and the natural and social sciences, appropriate for any student or researcher who needs a strong footing in the theory, problem-solving, and model-building that are the subject's hallmark.

Praise for the Third Edition "This volume is ground-breaking in terms of mathematical texts in that it does not teach from a detached perspective, but instead, looks to show students that competent mathematicians bring an intuitive understanding to the subject rather than just a master of applications." – Electric Review A comprehensive introduction, Linear Algebra: Ideas and Applications, Fourth Edition provides a discussion of the theory and applications of linear algebra that blends abstract and computational concepts. With a focus on the development of mathematical intuition, the book emphasizes the need to understand both the applications of a particular technique and the mathematical ideas underlying the technique. The book introduces each new concept in the context of an explicit numerical example, which allows the abstract concepts to grow organically out of the necessity to solve specific problems. The intuitive discussions are consistently followed by rigorous statements of results and proofs. Linear Algebra: Ideas and Applications, Fourth Edition also features: Two new and independent sections on the rapidly developing subject of wavelets A thoroughly updated section on electrical circuit theory Illuminating applications of linear algebra with self-study questions for additional study End-of-chapter summaries and sections with true-false questions to aid readers with further comprehension of the presented material Numerous computer exercises throughout using MATLAB® code Linear Algebra: Ideas and Applications, Fourth Edition is an excellent undergraduate-level textbook for one or two semester courses for students majoring in mathematics, science, computer science, and engineering. With an emphasis on intuition development, the book is also an ideal self-study reference.

Full of features and applications, this acclaimed textbook for upper undergraduate level and graduate level students includes all the major topics of computational linear algebra, including solution of a system of linear equations, least-squares solutions of linear

systems, computation of eigenvalues, eigenvectors, and singular value problems. Drawing from numerous disciplines of science and engineering, the author covers a variety of motivating applications. When a physical problem is posed, the scientific and engineering significance of the solution is clearly stated. Each chapter contains a summary of the important concepts developed in that chapter, suggestions for further reading, and numerous exercises, both theoretical and MATLAB and MATCOM based. The author also provides a list of key words for quick reference. The MATLAB toolkit available online, 'MATCOM', contains implementations of the major algorithms in the book and will enable students to study different algorithms for the same problem, comparing efficiency, stability, and accuracy.

Contains a collection of clever mathematical applications of linear algebra, mainly in combinatorics, geometry, and algorithms. Each chapter covers a single main result with motivation and full proof in at most ten pages and can be read independently of all other chapters (with minor exceptions), assuming only a modest background in linear algebra. --from publisher description
Numerical Linear Algebra with Applications is designed for those who want to gain a practical knowledge of modern computational techniques for the numerical solution of linear algebra problems, using MATLAB as the vehicle for computation. The book contains all the material necessary for a first year graduate or advanced undergraduate course on numerical linear algebra with numerous applications to engineering and science. With a unified presentation of computation, basic algorithm analysis, and numerical methods to compute solutions, this book is ideal for solving real-world problems. The text consists of six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra. It explains in great detail the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra. In addition to examples from engineering and science applications, proofs of required results are provided without leaving out critical details. The Preface suggests ways in which the book can be used with or without an intensive study of proofs. This book will be a useful reference for graduate or advanced undergraduate students in engineering, science, and mathematics. It will also appeal to professionals in engineering and science, such as practicing engineers who want to see how numerical linear algebra problems can be solved using a programming language such as MATLAB, MAPLE, or Mathematica. Six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra Detailed explanations and examples A through discussion of the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra Examples from engineering and science applications

This is a book on linear algebra and matrix theory. While it is self contained, it will work best for those who have already had some exposure to linear algebra. It is also assumed that the reader has had calculus. Some optional topics require more analysis than this, however. I think that the subject of linear algebra is likely the most significant topic discussed in undergraduate mathematics courses. Part of the reason for this is its usefulness in unifying so many different topics. Linear algebra is essential in analysis, applied math, and even in theoretical mathematics. This is the point of view of this book, more than a presentation of linear algebra for its own sake. This is why there are numerous applications, some fairly unusual.

Linear Algebra: Concepts and Applications is designed to be used in a first linear algebra course taken by mathematics and science majors. It provides a complete coverage of core linear algebra topics, including vectors and matrices, systems of linear equations, general vector spaces, linear transformations, eigenvalues, and eigenvectors. All results are carefully, clearly, and rigorously proven. The exposition is very accessible. The applications of linear algebra are extensive and substantial—several of those recur throughout the text in different contexts, including many that elucidate concepts from multivariable calculus. Unusual features of the text include a pervasive emphasis on the geometric interpretation and viewpoint as well as a very complete treatment of the singular value decomposition. The book includes over 800 exercises and numerous references to the author's custom software Linear Algebra Toolkit.

Linear algebra is the study of vector spaces and the linear maps between them. It underlies much of modern mathematics and is widely used in applications. A (Terse) Introduction to Linear Algebra is a concise presentation of the core material of the subject--those elements of linear algebra that every mathematician, and everyone who uses mathematics, should know. It goes from the notion of a finite-dimensional vector space to the canonical forms of linear operators and their matrices, and covers along the way such key topics as: systems of linear equations, linear operators and matrices, determinants, duality, and the spectral theory of operators on inner-product spaces. The last chapter offers a selection of additional topics indicating directions in which the core material can be applied. The Appendix provides all the relevant background material. Written for students with some mathematical maturity and an interest in abstraction and formal reasoning, the book is self-contained and is appropriate for an advanced undergraduate course in linear algebra.

This textbook invites students to discover abstract ideas in linear algebra within the context of applications. Diffusion welding and radiography, the two central applications, are introduced early on and used throughout to frame the practical uses of important linear algebra concepts. Students will learn these methods through explorations, which involve making conjectures and answering open-ended questions. By approaching the subject in this way, new avenues for learning the material emerge: For example, vector spaces are introduced early as the appropriate setting for the applied problems covered; and an alternative, determinant-free method for computing eigenvalues is also illustrated. In addition to the two main applications, the authors also describe possible pathways to other applications, which fall into three main areas: Data and image analysis (including machine learning); dynamical modeling; and optimization and optimal design. Several appendices are included as well, one of which offers an insightful walkthrough of proof techniques. Instructors will also find an outline for how to use the book in a course. Additional resources can be accessed on the authors' website, including code, data sets, and other helpful material. Application-Inspired Linear Algebra will motivate and immerse undergraduate students taking a first course in linear algebra, and will provide instructors with an indispensable, application-first approach.