

ZMATH 2009f.00519**Busam, Rolf; Epp, Thomas****Examination trainer linear algebra. 500 questions and answers for Bachelor's degree and prediploma. (Prüfungstrainer lineare Algebra. 500 Fragen und Antworten für Bachelor und Vordiplom.)**

Heidelberg: Spektrum Akademischer Verlag (ISBN 978-3-8274-1976-7/pbk). viii, 245 p. (2009).

Verlagsinformation: Dieser "Prüfungstrainer" wendet sich an Studierende mit Mathematik als Haupt- oder Nebenfach, die – insbesondere bei der Prüfungs- oder Klausurvorbereitung – den Wunsch verspüren, als Ergänzung zu den Lehrbüchern den Grundstudiums-Stoff der Linearen Algebra noch einmal in pointierter Form vorliegen zu haben, zugespitzt auf dasjenige, was man wirklich wissen und beherrschen sollte, um eine Prüfung erfolgreich zu bestehen und exakte Antworten auf mögliche Fragen formulieren zu können. In einem knappen Frage-Antworten-Stil werden die zentralen Begriffe und Beweise der Linearen Algebra wiederholt. Mehr noch als auf die Rechenfähigkeit (die sicherlich auch notwendig ist und nicht zu kurz kommt) wird Wert auf das Verständnis wichtiger Konzepte gelegt, deren grundsätzliche Bedeutung durch viele Querverweise auf Anwendungen in anderen Gebieten der Mathematik sowie der Natur- und Computerwissenschaften illustriert wird. Dem Autorentduo – einem Dozenten mit langjähriger Vorlesungs- und Prüfungserfahrung und einem Mathematikabsolventen – ist es sehr gut gelungen, mit der Auswahl der Fragen ein realistisches Bild davon zu vermitteln, was einen Studenten in der mündlichen Prüfung oder einer Klausur typischerweise erwartet. Durch die Gliederung des Stoffes in einzelne Fragen eignet sich das Buch ausgezeichnet dazu, Wissen stichpunktartig zu trainieren und zu überprüfen; auch höhere Semester können davon profitieren, wenn sie schon einmal Gelerntes noch einmal gezielt nachschlagen wollen. Eine besondere Attraktion stellen die zahlreichen Abbildungen dar, die geometrische Sachverhalte veranschaulichen.

At German universities, the first year of undergraduate studies in mathematics includes a two-semester basic course "Linear Algebra and Analytic Geometry" as an essential part of the general teaching program. Passing the corresponding written or oral exam in this fundamental teaching discipline is a necessary condition for receiving the Bachelor's degree or the pre-diploma degree in mathematics and in some related physical sciences. In view of the crucial importance of both this very basic course and the exam following it, which usually cause some (natural) difficulties for novices in mathematics, a special guide for students who are preparing for this exam should be regarded as an utmost useful supplementary aid. The book under review provides exactly such a special examination coach for the basic course "Linear Algebra", including the related aspects of affine geometry, Euclidean geometry, and projective geometry. Written by two very experienced instructors, this book recalls the fundamental concepts, methods, techniques, theorems, proofs, and applications of linear algebra in a simulated examination style. This is done by compiling the most important basic facts from linear algebra in a concise question-answer scheme, just as a real exam is likely to take its course. The 500 concrete questions are the most typical ones for such an exam in linear algebra and linear geometry, and they cover the basic material in an exhaustive manner. Variants of precise answers are given immediately and in great detail, thereby helping the student repeat the entire course systematically. However, the present book is neither a substitute for a textbook on the subject nor for the student's course notes. Also, it cannot be compared to any of the numerous problem books in linear algebra. Instead, working with this book requires a profound familiarity with the material from a basic course on the subject, and the focus is on related theoretical exam questions rather than on tedious computational problems or additional illustrating results. As for the contents, the questions and answers are organized in seven separate chapters. These cover the following standard topics in linear algebra and linear geometry: (1) Basic algebraic concepts, including groups, rings, fields, and polynomial rings; (2) Vector spaces; (3) Linear maps and matrices, including systems of linear equations and dual vector spaces; (4) Alternating multilinear forms and determinants; (5) Eigenvalues, eigenspaces, and normal forms of matrices; (6) Euclidean and Hermitean vector spaces; (7) Applications to geometry, including affine geometry, projective geometry, and quadrics. This particular disposition, together with the organization of the material in question-answer units, helps the student prepare his or her exam in a selective manner, according to the individual needs, thereby making the present examination coach very flexible and efficient. In general, the book is perfectly suitable for testing the acquired knowledge of basic linear algebra and its applications to geometry, or for brushing it up if necessary.

*Werner Kleinert (Berlin)**Classification:* H65 U45 U95*Keywords:* refresher course linear algebra; problem book; linear algebra; matrix calculus; affine geometry; Euclidean geometry; projective geometry; quadrics