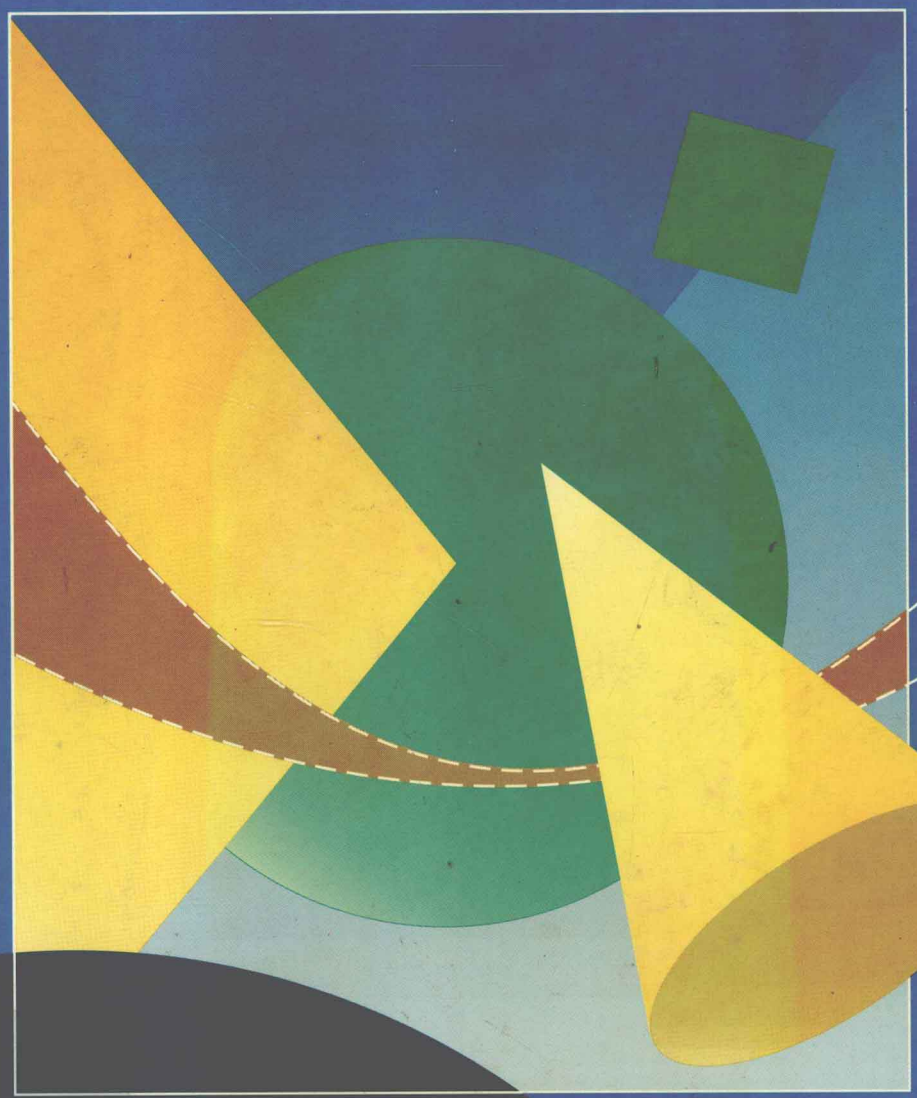
ALGEBRA

for College Students

Third Edition



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ALGEBRA

for College Students

THIRD EDITION

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PREFACE

The third edition of *Algebra for College Students* provides mathematically sound and comprehensive coverage of the topics considered essential in an intermediate algebra course. Our strategy in preparing this revision has been to build on the successful features of the second edition, features designed to enhance the student's mastery of math skills. *Algebra for College Students* provides a complete, integrated learning system organized by objectives and linked to the ancillary package. All of the components of the package were written by the authors.

Features

The Interactive Approach

Instructors have long recognized the need for a text that requires the student to use a skill as it is being taught. *Algebra for College Students* uses an interactive technique that meets this need. Each section is divided into objectives, and every objective contains one or more sets of matched-pair examples. The first example in each set is worked out; the second example is not. By solving this second problem, the student interacts with the text. The complete worked-out solutions to these problems are provided in an appendix at the end of the book, so the student can obtain immediate feedback on and reinforcement of the skill being learned.

Emphasis on Problem-Solving Strategies

Algebra for College Students features a carefully developed approach to problem solving that emphasizes developing strategies to solve problems. For each type of word problem contained in the text, the student is prompted to use a "strategy step" before performing the actual manipulation of numbers and variables. By developing problem-solving strategies, the student will know better how to analyze and solve those word problems encountered in an intermediate algebra course.

Applications

The traditional approach to teaching or reviewing algebra covers only the straightforward manipulation of numbers and variables and thereby fails to teach students the practical value of algebra. By contrast, *Algebra for College Students* emphasizes applications. Wherever appropriate, the last objective in

each section presents applications that require the student to use the skills covered in that section to solve practical problems. Most of Chapter 2, *"First-Degree Equations and Inequalities,"* and portions of several other chapters are devoted entirely to applications. This carefully integrated applied approach generates awareness on the student's part of the value of algebra as a real-life tool.

Complete, Integrated Learning System Organized by Objectives

Each chapter begins with a list of the learning objectives included within that chapter. Each of the objectives is then restated in the chapter to remind the student of the current topic of discussion. The same objectives that organize the text organize each ancillary. The Solutions Manual, Student's Solutions Manual, Computerized Test Generator, Computer Tutor™, Videos, Transparencies, Test Bank, and the Printed Testing Program have all been prepared so that both the student and instructor can easily connect all of the different aids.

Exercises

There are more than 6000 exercises in the text, grouped in the following categories:

- **End-of-section exercise sets,** which are keyed to the corresponding learning objectives, provide ample practice and review of each skill.
- **Supplemental exercise sets,** designed to increase the student's ability to solve problems requiring a combination of skills, have been added at the end of each section.
- **Chapter review exercises,** which appear at the end of each chapter, help the student integrate all of the skills presented in the chapter.
- **Chapter tests,** which appear at the end of each chapter, are typical one-hour exams that the student can use to prepare for an in-class test.
- **Cumulative review exercises,** which appear at the end of each chapter (beginning with Chapter 2), help the student retain math skills learned in earlier chapters.
- **The final exam,** which follows the last chapter, can be used as a review item or practice final.

Calculator and Computer Enrichment Topics

Each chapter also contains optional calculator or computer enrichment topics. Calculator topics provide the student with valuable key-stroking instructions and practice in using a hand-held calculator. Computer topics correspond

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directly to the programs found on the Math ACE (Additional Computer Exercises) Disk. These topics range from solving first-degree equations to graphing an ellipse or a hyperbola.

New To This Edition

Topical Coverage

In Chapter 2, the material on inequalities and absolute value equations has been placed at the end of the chapter, with the result that all applications of first-degree equations follow the section on solving first-degree equations. The introductory applications material has been changed to allow for a better development of problem-solving skills, and the presentation of integer problems postponed until Section 2.2 to allow for a better understanding of this material.

In Chapter 3, the reorganization of the material on integer exponents has negative exponents defined prior to division of monomials; therefore, a single rule for division of monomials is stated. Scientific notation is now presented in Chapter 3 in order to reinforce the material on integer exponents. The material on division of polynomials has also been included in this chapter, thus completing the material on operations on polynomials. Factoring by grouping is presented earlier in Chapter 3, enabling trinomials of the form $ax^2 + bx + c$ to be factored by grouping as well as by trial and error. Factoring trinomials that are quadratic in form is presented here, rather than postponed until Chapter 7.

In Chapter 4, proportions are included in the objective on solving equations containing fractions.

In Chapter 6, the material on graphing the solution set of an inequality in two variables is placed at the end of the chapter, enabling students to use all the graphing skills presented in the chapter to graph these inequalities.

Chapter 7 includes solving inequalities by factoring (previously in Chapter 3) and solving rational inequalities (previously in Chapter 4).

In Chapter 8, the material on composite functions has been expanded, and applications of functions (maximum and minimum problems) have been included.

Chapter 9 introduces the midpoint formula, which is then used in the objectives involving equations of circles.

In Chapter 10, the expansion of determinants by cofactors has been added.

The application problems throughout the text have been rewritten. Many have been updated to reflect contemporary situations.

Graphing Calculator

Material on using a graphing calculator has been included in the Calculators and Computers feature of chapters that present material on graphing.

New Applications Feature

Each chapter now includes an expanded application feature entitled Something Extra. Topics include such concepts as Venn diagrams, trajectories, cryptography, linear programming, and the Fibonacci Sequence.

Challenge Exercises

Challenge exercises are now denoted in the Instructor's Annotated Edition. An asterisk (*) is printed next to those Supplemental Exercises which require more analytical thought.

Chapter Review and Chapter Test

The Chapter Review at the end of each chapter has been expanded to include nearly twice the number of review exercises, and a Chapter Test has been added. The objective references for each of these features are provided in the Answer Section at the back of the book so that the student can determine which objectives require restudy.

New Testing Program

Both the Computerized Testing Program and the Printed Testing Program have been completely rewritten to provide instructors with the option of creating countless new tests. The computerized test generator contains high quality graphics and editing capabilities for all nongraphic questions.

New Transparencies

Approximately 150 transparencies containing the worked-out solutions to the "student problems" in the text have been added.

Supplements for the Student

Two computerized study aids, the Computer Tutor™ and the Math ACE (Additional Computer Exercises) Disk have been carefully designed for the student.

The COMPUTER TUTOR™

The Computer Tutor™ is an interactive instructional microcomputer program for student use. Each learning objective in the text is supported by a lesson on the Computer Tutor™. As a reminder of this, a small computer icon appears to the right of each objective title in the text. Lessons on the tutor provide additional instruction and practice and can be used in several ways: (1) to cover material the student missed because of absence from class; (2) to repeat instruction on a skill or concept that the student has not yet mastered; or (3) to review material in preparation for examinations. This tutorial program is available for the IBM PC and compatible computers, the Apple II family of computers, and the Macintosh. The IBM and Macintosh versions of the Computer Tutor™ have been expanded to include nine "you-try-it" examples for each lesson.

Math ACE (Additional Computer Exercises) Disk

The Math ACE Disk contains a number of computational and drill-and-practice programs that correspond to selected Calculator and Computer Enrichment Topics in the text. These programs are available for the Apple II family of computers and the IBM PC and compatible computers.

Student's Solutions Manual

The Student's Solutions Manual contains the complete worked-out solutions for all the odd-numbered exercises in the text. Also included are the complete solutions to the Chapter Reviews, Chapter Tests, and Cumulative Reviews.

Videotapes

Over 50 half-hour videotape lessons accompany *Algebra for College Students*. These lessons follow the format and style of the text and are closely tied to specific sections of the text.

Supplements for the Instructor

Algebra for College Students has an unusually complete set of teaching aids for the instructor.

Instructor's Annotated Edition

The Instructor's Annotated Edition is an exact replica of the student text except that the answers to all of the exercises are printed in color next to the problems.

Solutions Manual

The Solutions Manual contains worked-out solutions for all end-of-section exercise sets, chapter reviews, chapter tests, cumulative reviews, and the final exam.

Instructor's Resource Manual with Chapter and Cumulative Tests

The Instructor's Resource Manual/Testing Program contains the printed testing program, which is the first of three sources of testing material available to users of *Algebra for College Students*. Eight printed tests (in two formats—free response and multiple choice) are provided for each chapter, as are cumulative and final exams. In addition, the Instructor's Manual includes the documentation for all the software ancillaries (ACE, the Computer Tutor™, and the Instructor's Computerized Test Generator) as well as suggested course sequences.

Instructor's Computerized Test Generator

The Instructor's Computerized Test Generator is the second source of testing material for use with *Algebra for College Students*. The database contains over 1900 new test items. These questions are unique to the test generator and do not repeat items provided in the Instructor's Resource Manual/Testing Program. Organized according to the keyed objectives in the text, the Test Generator is designed to produce an unlimited number of tests for each chapter of the text, including cumulative tests and final exams. It is available for the Apple II family of computers and the Macintosh. It is also available for the IBM PC or compatible computers with editing capabilities for all nongraphic questions.

Test Bank

The Printed Test Bank, the third component of the testing materials, is a printout of all items in the Instructor's Computerized Test Generator. Instructors using the Test Generator can use the test bank to select specific items from the database. Instructors who do not have access to a computer can use the test bank to select items to be included on a test being prepared by hand.

Transparencies

Approximately 150 transparencies accompany *Algebra for College Students*. These transparencies contain the complete solution to every "student problem" in the text.

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TO THE STUDENT

Many students feel that they will never understand math while others appear to do very well with little effort. Oftentimes what makes the difference is that successful students take an active role in the learning process.

Learning mathematics requires your *active* participation. Although doing homework is one way you can actively participate, it is not the only way. First, you must attend class regularly and become an active participant. Second, you must become actively involved with the textbook.

Algebra for College Students was written and designed with you in mind as a participant. Here are some suggestions on how to use the features of this textbook.

There are 12 chapters in this text. Each chapter is divided into sections and each section is subdivided into learning objectives. Each learning objective is labeled with a number from 1–5.

First, read each objective statement carefully so you will understand the learning goal that is being presented. Next, read the objective material carefully, being sure to note each bold word. These words indicate important concepts that you should familiarize yourself with. Study each in-text example carefully, noting the techniques and strategies used to solve the example.

You will then come to the key learning feature of this text, the paired Examples and Problems. These Examples and Problems have been designed to assist you in a very specific way. Notice that the Examples are completely worked-out and explanations are given for certain steps within the solutions. The solutions to the Problems are not given; *you* are expected to work these Problems, thereby testing your understanding of the material you have just studied.

Study the Examples carefully by working through each step presented. Then use the worked-out example as a model for solving the Problems. When you have completed your solution, check your work by turning to the page in the Appendix where the complete solution is given. The page number on which the solution appears is printed on the solution line below the Problem statement. By checking your solution, you will know immediately whether or not you fully understand the skill just studied.

When you have completed studying an objective, do the exercises in the exercise set that correspond with that objective. The exercises are labeled with the same number as the objective. Algebra is a subject that needs to be learned in

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small sections and practiced continually in order to be mastered. Doing the exercises in each exercise set will help you master the problem-solving techniques necessary for success.

Once you have completed the exercises for an objective, you should check your answers to the odd-numbered exercises with those found in the back of the book.

After completing a chapter, read the Chapter Summary. This summary highlights the important topics covered in the chapter. Following the Chapter Summary are Chapter Review Exercises, a Chapter Test, and a Cumulative Review (beginning with Chapter 2). Doing the review exercises is an important way of testing your understanding of the chapter. The answer to each review exercise is in an appendix at the back of the book. Each answer is followed by a reference that tells which objective that exercise was taken from. For example, (4.2.2) means Section 4.2, Objective 2. After checking your answers, restudy any objective that corresponds to an exercise you answered incorrectly. It may be very helpful to retry some of the exercises for that objective to reinforce your problem-solving techniques.

The Chapter Test should be used to prepare for an exam. We suggest that you try the Chapter Test a few days before your actual exam. Take the test in a quiet place and try to complete the test in the same amount of time you will be allowed for your exam. When taking the Chapter Test, practice the strategies of successful test takers: 1) scan the entire test to get a feel for the questions; 2) read the directions carefully; 3) work the problems that are easiest for you first; and perhaps most importantly, 4) try to stay calm.

When you have completed the Chapter Test, check your answers. If you missed a question, review the material in that objective and rework some of the exercises from that objective. This will strengthen your ability to perform the skills in that objective.

The Cumulative Review allows you to refresh the skills you have learned in previous chapters. This is very important in mathematics. By consistently reviewing previous materials, you will retain the previous skills as you build new ones.

Remember, to be successful, attend class regularly; read the textbook carefully; actively participate in class; work with your textbook using the Examples and Problems for immediate feedback and reinforcement of each skill; do all the homework assignments; review constantly; and work carefully.

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