Students begin college algebra classes with widely varying backgrounds. Some haven’t taken a math course in several years and may need to spend time reviewing prerequisite topics, while others are ready to jump right into new and challenging material. In Chapter P and in some of the early sections of other chapters, we have provided review material in such a way that it can be used or omitted as appropriate for your course. In addition, students may follow several paths after completing a college algebra course. Many will continue their study of mathematics in courses such as finite mathematics, statistics, and calculus. For others, college algebra may be their last mathematics course.

Responding to the current and future needs of all of these students was essential in creating this text. We introduce each exercise set with several concept and vocabulary exercises, consisting of fill-in-the-blank and true-false exercises. They are not computation-reliant, but rather test whether students have absorbed the basic concepts and vocabulary of the section. Exercises asking students to extrapolate information from a given graph now appear in much greater number and depth throughout the course. We continue to present our content in a systematic way that illustrates how to study and what to review. We believe that if students use this material well, they will succeed in this course. The changes in this edition result from the thoughtful feedback we have received from students and instructors who have used previous editions of the text. This feedback crucially enhances our own experiences, and we are extremely grateful to the many contributors whose insights are reflected in this new edition.

Key Content Changes

EXERCISES  We continue to improve the balance of exercises, providing a smoother transition from the less challenging to the more challenging exercises.

Concept and Vocabulary Exercises. Each exercise section begins with exercises that assess the student’s grasp of the definitions and ideas introduced in that section. These true-false and fill-in-the-blank exercises help to rapidly identify gaps in comprehension of the material in that section.

Exercises Preparing Students for Material in the Next Section. Each exercise section ends with a set of exercises titled Getting Ready for the Next Section that provides a review of the concepts and skills that will be used in the following section.

Graph and Data-Related Exercises. We have introduced exercises throughout the text that demonstrate how to extract information about real-world situations from a graphical representation of that situation, as well as how to recover algebraic or trigonometric formulations of a graph by using key characteristics of that graph.

Modeling Exercises. A section on building linear, exponential, logarithmic, and power models from data was added in Chapter 4; this section contains new exercises using each type of model.

Overall, approximately 20% of the exercises have been updated, and more than 400 brand-new exercises have been added. These new exercises primarily consist of applications that connect with students’ everyday experiences and enhance students’ understanding of graphing.

CHAPTER 1
• Added a separate section, Applications of Linear Equations: Modeling, as Section 1.2. This moved some material from Section 1.1 on linear equations in the previous edition into Section 1.2, providing two relatively short sections that are more easily covered in one lecture.
• Introduced the discriminant, showing how to determine the number and type of solutions (rational or irrational) to a quadratic equation having integer coefficients.
• Provided simpler introductory examples for material students typically find difficult.

CHAPTER 2
• Introduced “delta x” and “delta y” notation when we discussed the slope of a line.
• Expanded the discussion on modeling data using linear regression.
• Added real-world examples to the discussion of increasing and decreasing functions and finding maxima and minima, and expanded the discussion on turning points.
• Added real-world examples to the discussion of average rate of change.

CHAPTER 3
• A Summary of Main Facts has been added to the section on quadratic functions.
• Expanded the discussion on functions of even and odd degree and on the end behavior of polynomial functions.
• Added an example showing how to graph a polynomial given in factored form.
• Expanded the discussion on horizontal asymptotes, along with improved graphics.
CHAPTER 4
- Added a schematic showing various transformations of the graph of \( f(x) = e^x \).
- Expanded the discussion of exponential growth and decay.
- Added a schematic showing various transformations of the graph of \( f(x) = \log_a x \).
- Added a comparison of the end behavior (as \( x \) approaches infinity) of the exponential, logarithmic and linear functions.
- Added a procedure for solving logarithmic equations using exponential form.
- Added material on building linear, exponential, logarithmic, and power models from data.

CHAPTER 5
- Added a summary of the methods for solving three equations in three unknowns.
- Added an example showing how to find a partial-fraction decomposition when the denominator has repeated linear factors.

CHAPTER 6
- Added a schematic showing the most common transformations and their corresponding matrices.
- Added a discussion about the connection between combining transformations and multiplying their corresponding matrices and showing that the order in which the transformations are performed matters.

CHAPTER 7
- Sections 7.2, 7.3, and 7.4 have additional examples showing how to obtain the equation of the conic discussed in that section from key characteristics of its graph.

CHAPTER 8
- Expanded discussion, with examples, showing the connection between arithmetic sequences and linear functions and between geometric sequences and exponential functions.

Features

CHAPTER OPENER Each chapter opener includes a description of applications (one of them illustrated) relevant to the content of the chapter and the list of topics that will be covered. In one page, students see what they are going to learn and why they are learning it.

SECTION OPENER WITH APPLICATION Each section opens with a list of prerequisite topics, complete with section and page references, which students can review prior to starting the section. The Objectives of the section are also clearly stated and numbered, and then referenced again in the margin of the lesson at the point where the objective’s topic is taught. An Application containing a motivating anecdote or an interesting problem then follows. An example later in the section relating to this application and identified by the same icon () is then solved using the mathematics covered in the section. These applications utilize material from a variety of fields: the physical and biological sciences (including health sciences), economics, art and architecture, history, and more.

EXAMPLES AND PRACTICE PROBLEMS Examples include a wide range of computational, conceptual, and modern applied problems carefully selected to build confidence, competency, and understanding. Every example has a title indicating its purpose and presents a detailed solution containing annotated steps. All examples are followed by a Practice Problem for students to try so that they can check their understanding of the concept covered. Answers to the Practice Problems are provided just before the section exercises.

PROCEDURE BOXES These boxes, interspersed throughout the text, present important procedures in numbered steps. Special Procedure in Action boxes present important multistep procedures, such as the steps for doing synthetic division, in a two-column format. The steps of the procedure are given in the left column, and an example is worked, following these steps, in the right column. This approach provides students with a clear model with which they can compare when encountering difficulty in their work. These boxes are a part of the numbered examples.

ADDITIONAL PEDAGOGICAL FEATURES Definitions, Theorems, Properties, and Rules are all boxed and titled for emphasis and ease of reference. Warnings appear as appropriate throughout the text to apprise students of common errors and pitfalls that can trip them up in their thinking or calculations.
Summary of Main Facts boxes summarize information related to equations and their graphs, such as those of the conic sections.

A Calculus Symbol \( \frac{\text{d}}{\text{d}t} \) appears next to information in the text that is essential for the study of calculus.

MARGIN NOTES

Side Notes provide hints for handling newly introduced concepts.

Recall notes remind students of a key idea learned earlier in the text that will help them work through a current problem.

Technology Connections give students tips on using calculators to solve problems, check answers, and reinforce concepts. Note that the use of graphing calculators is optional in this text.

Do You Know? features provide students with additional interesting information on topics to keep them engaged in the mathematics presented.

Historical Notes give students information on key people or ideas in the history and development of mathematics.

EXERCISES The heart of any textbook is its exercises, so we have tried to ensure that the quantity, quality, and variety of exercises meet the needs of all students. Exercises are carefully graded to strengthen the skills developed in the section and are organized using the following categories.

Concepts and Vocabulary exercises begin each exercise set with problems that assess the student’s grasp of the definitions and ideas introduced in that section. These true-false and fill-in-the-blank exercises help to rapidly identify gaps in comprehension of the material in that section. Building Skills exercises develop fundamental skills—each odd-numbered exercise is closely paired with its consecutive even-numbered exercise. Applying the Concepts features use the section’s material to solve real-world problems—all are titled and relevant to the topics of the section. Beyond the Basics exercises provide more challenging problems that give students an opportunity to reach beyond the material covered in the section—these are generally more theoretical in nature and are suitable for honors students, special assignments, or extra credit. Critical Thinking/Discussion/Writing exercises, appearing as appropriate, are designed to develop students’ higher-level thinking skills. Calculator problems, identified by \( \boxed{\text{C}} \), are included where needed. Getting Ready for the Next Section exercises end each exercise set with problems that provide a review of concepts and skills that will be used in the following section.

CHAPTER REVIEW AND TESTS The chapter-ending material begins with an extensive Review featuring a two-column, section-by-section summary of the definitions, concepts, and formulas covered in that chapter, with corresponding examples. This review provides a description and examples of key topics indicating where the material occurs in the text, and encourages students to reread sections rather than memorize definitions out of context. Review Exercises provide students with an opportunity to practice what they have learned in the chapter. Then students are given two chapter test options. They can take Practice Test A in the usual open-ended format and/or Practice Test B, covering the same topics, in a multiple-choice format. All tests are designed to increase student comprehension and verify that students have mastered the skills and concepts in the chapter. Mastery of these materials should indicate a true comprehension of the chapter and the likelihood of success on the associated in-class examination. Cumulative Review Exercises appear at the end of every chapter, starting with Chapter 2, to remind students that mathematics is not modular and that what is learned in the first part of the book will be useful in later parts of the book and on the final examination.
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• **Skill Builder** offers adaptive practice that is designed to increase students’ ability to complete their assignments. By monitoring student performance on homework, Skill Builder adapts to each student’s needs and provides just-in-time, in-assignment practice to help enhance the student’s proficiency in meeting key learning objectives.

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Resources for Success

MyLab Math Online Course for *College Algebra*, 4th ed., by J. S. Ratti, Marcus McWaters, and Lesław Skrzypek (access code required)

MyLab Math is available to accompany Pearson's market-leading text offerings. To give students a consistent tone, voice, and teaching method each text's flavor and approach is tightly integrated throughout the accompanying MyLab Math course, making learning the material as seamless as possible.

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Video Assessment questions are assignable MyLab Math exercises tied to Example Solution videos. The questions are designed to check students' understanding of the important math concepts covered in the video. The videos and Video Assessment questions provide an active learning environment where students can work at their own pace.

**Video Notebook**

The Video Notebook is a guide that gives students a structured place to take notes and work on the example problems as they watch the videos. Definitions and important concepts are highlighted, and helpful hints are pointed out along the way. The notebook is available in MyLab Math for download.

**Concepts and Vocabulary Exercises**

Each exercise section begins with exercises that assess the student's grasp of the definitions and ideas introduced in that section. These true-false and fill-in-the-blank exercises help to rapidly identify gaps in comprehension of the material in that section and are assignable in MyLab Math and Learning Catalytics.

[Link: pearson.com/mylab/math]
Resources for Success

**Instructor Resources**
Additional resources can be downloaded from www.pearson.com or hardcopy resources can be ordered from your sales representative.

**Annotated Instructor's Edition**
Answers are included on the same page beside the text exercises, where possible, for quick reference.

**Instructor's Solutions Manual**
Written by Beverly Fusfield, the Instructor’s Solutions Manual provides complete solutions for all end-of-section exercises, including the Critical Thinking/Discussion/Writing Projects, Practice Problems, Chapter Review exercises, Practice Tests, and Cumulative Review problems.

**Instructor's Testing Manual**
The Instructor's Testing Manual includes diagnostic pretests, chapter tests, and additional test items, grouped by section, with answers provided.

**TestGen®**
TestGen® (pearsoned.com/testgen) enables instructors to build, edit, print, and administer tests using a computerized bank of questions developed to cover all the objectives of the text.

**PowerPoint® Lecture Slides**
The PowerPoint Lecture Slides feature presentations written and designed specifically for this text, including figures and examples from the text.

**Sample Assignments in MyLab Math**
Enhanced Sample Assignments created by the authors make course set-up easier by giving instructors a starting point for each chapter. Each assignment, handpicked by the author team to align with this text, includes a thoughtful mix of question types (e.g., conceptual, skills) specific to that topic. Each assignment includes new MyLab Math question types, such as vocabulary, video assessments, and set up and solve questions.

**Student Resources**
Additional resources are available to help students succeed.

**Video Lectures**
Over 20 hours of video instruction feature Section Summaries and Example Solutions. Section Summaries cover key definitions and procedures for most sections. Example Solutions walk students through the detailed solution process for many examples in the textbook. Optional subtitles are available in English and Spanish.

**Student’s Solutions Manual**
Written by Beverly Fusfield, the Student's Solutions Manual provides detailed worked-out solutions to the odd-numbered end-of-section and Chapter Review exercises and solutions to all of the Practice Problems, Practice Tests, and Cumulative Review problems. Also available in MyLab Math.

**Video Notebook**
The Video Notebook is a note-taking guide that gives students a structured place to take notes and work the example problems as they watch the videos. Definitions and important concepts are highlighted, and helpful hints are pointed out along the way. The Video Notebook is available as PDFs and customizable Word files in MyLab Math.

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We invite all who use this book to send suggestions for improvements to Marcus McWaters at mmm@usf.edu.
Dedication

To Our Wives,

Lata, Debra, and Leslie