WELCOME TO THE 12TH EDITION

In the twelfth edition of Essentials of College Algebra, we continue our ongoing commitment to providing the best possible text to help instructors teach and students succeed. In this edition, we have remained true to the pedagogical style of the past while staying focused on the needs of today’s students. Support for all classroom types (traditional, hybrid, and online) may be found in this classic text and its supplements backed by the power of Pearson’s MyLab Math.

In this edition, we have drawn upon the extensive teaching experience of the Lial team, with special consideration given to reviewer suggestions. General updates include enhanced readability with improved layout of examples, better use of color in displays, and language written with students in mind. Over 200 calculator screenshots have been updated and now provide color displays to enhance students’ conceptual understanding. Each homework section now begins with six to ten Concept Preview exercises, assignable in MyLab Math, which may be used to ensure students’ understanding of vocabulary and basic concepts prior to beginning the regular homework exercises.

Further enhancements include numerous current data examples and exercises that have been updated to reflect current information. Additional real-life exercises have been included to pique student interest; answers to writing exercises have been provided; better consistency has been achieved between the directions that introduce examples and those that introduce the corresponding exercises; and better guidance for rounding of answers has been provided in the exercise sets.

The Lial team believes this to be our best Essentials of College Algebra edition yet, and we sincerely hope that you enjoy using it as much as we have enjoyed writing it. Additional textbooks in this series are as follows.

- College Algebra, Twelfth Edition
- Trigonometry, Eleventh Edition
- College Algebra and Trigonometry, Sixth Edition
- Precalculus, Sixth Edition

HIGHLIGHTS OF NEW CONTENT

- In Chapter R, more detail has been added to set-builder notation, illustrations of the rules for exponents have been provided, and many exercises have been updated to better match section examples.

- Several new and updated application exercises have been inserted into the Chapter 1 exercise sets. New objectives have been added to Section 1.4 outlining the four methods for solving a quadratic equation, along with guidance suggesting when each method may be used efficiently.

- Chapters 2 and 3 contain numerous new and updated application exercises, along with many updated calculator screenshots that are now provided in color. In response to reviewer suggestions, the discussion on increasing, decreasing, and constant functions in Section 2.3 has been written to apply to open intervals of the domain.

- In Chapter 4, greater emphasis is given to the concept of exponential and logarithmic functions as inverses, there is a new table providing descriptions of the additional properties of exponents, and additional exercises requiring graphing logarithmic functions with translations have been included. There are also many new and updated real-life applications of exponential and logarithmic functions.
In Chapter 5, special attention has been given to finding partial fraction decompositions in Section 5.4 and to linear programming in Section 5.6. Examples have been rewritten to promote student understanding of these difficult topics.

For visual learners, numbered Figure and Example references within the text are set using the same typeface as the figure number itself and bold print for the example. This makes it easier for the students to identify and connect them. We also have increased our use of a “drop down” style, when appropriate, to distinguish between simplifying expressions and solving equations, and we have added many more explanatory side comments. Guided Visualizations, with accompanying exercises and explorations, are now available and assignable in MyLab Math.

Essentials of College Algebra is widely recognized for the quality of its exercises. In the twelfth edition, nearly 700 are new or modified, and hundreds present updated real-life data. Furthermore, the MyLab Math course has expanded coverage of all exercise types appearing in the exercise sets, as well as the mid-chapter Quizzes and Cumulative Reviews.

FEATURES OF THIS TEXT

SUPPORT FOR LEARNING CONCEPTS

We provide a variety of features to support students’ learning of the essential topics of college algebra. Explanations that are written in understandable terms, figures and graphs that illustrate examples and concepts, graphing technology that supports and enhances algebraic manipulations, and real-life applications that enrich the topics with meaning all provide opportunities for students to deepen their understanding of mathematics. These features help students make mathematical connections and expand their own knowledge base.

Examples Numbered examples that illustrate the techniques for working exercises are found in every section. We use traditional explanations, side comments, and pointers to describe the steps taken—and to warn students about common pitfalls. Some examples provide additional graphing calculator solutions, although these can be omitted if desired.

Now Try Exercises Following each numbered example, the student is directed to try a corresponding odd-numbered exercise (or exercises). This feature allows for quick feedback to determine whether the student has understood the principles illustrated in the example.

Real-Life Applications We have included hundreds of real-life applications, many with data updated from the previous edition. They come from fields such as business, entertainment, sports, biology, astronomy, geology, and environmental studies.

Function Boxes Beginning in Chapter 2, functions provide a unifying theme throughout the text. Special function boxes offer a comprehensive, visual introduction to each type of function and also serve as an excellent resource for reference and review. Each function box includes a table of values, traditional and calculator-generated graphs, the domain, the range, and other special information about the function. These boxes are assignable in MyLab Math.
Figures and Photos  Today’s students are more visually oriented than ever before, and we have updated the figures and photos in this edition to promote visual appeal. NEW Guided Visualizations with accompanying exercises and explorations are now available and assignable in MyLab Math.

Use of Graphing Technology  We have integrated the use of graphing calculators where appropriate, although this technology is completely optional and can be omitted without loss of continuity. We continue to stress that graphing calculators support understanding but that students must first master the underlying mathematical concepts. Exercises that require the use of a graphing calculator are marked with the icon.

Cautions and Notes  Text that is marked CAUTION warns students of common errors, and NOTE comments point out explanations that should receive particular attention.

Looking Ahead to Calculus  These margin notes offer glimpses of how the topics currently being studied are used in calculus.

SUPPORT FOR PRACTICING CONCEPTS
This text offers a wide variety of exercises to help students master college algebra. The extensive exercise sets provide ample opportunity for practice, and the exercise problems increase in difficulty so that students at every level of understanding are challenged. The variety of exercise types promotes understanding of the concepts and reduces the need for rote memorization.

NEW Concept Preview  Each exercise set now begins with a group of CONCEPT PREVIEW exercises designed to promote understanding of vocabulary and basic concepts of each section. These new exercises are assignable in MyLab Math and will provide support especially for hybrid, online, and flipped courses.

Exercise Sets  In addition to traditional drill exercises, this text includes writing exercises, optional graphing calculator problems, and multiple-choice, matching, true/false, and completion exercises. Those marked Concept Check focus on conceptual thinking. Connecting Graphs with Equations exercises challenge students to write equations that correspond to given graphs.

Relating Concepts Exercises  Appearing at the end of selected exercise sets, these groups of exercises are designed so that students who work them in numerical order will follow a line of reasoning that leads to an understanding of how various topics and concepts are related. All answers to these exercises appear in the student answer section, and these exercises are assignable in MyLab Math.

Complete Solutions to Selected Exercises  Complete solutions to all exercises marked are available in the eText. These are often exercises that extend the skills and concepts presented in the numbered examples.
SUPPORT FOR REVIEW AND TEST PREP

Ample opportunities for review are found within the chapters and at the ends of chapters. Quizzes that are interspersed within chapters provide a quick assessment of students’ understanding of the material presented up to that point in the chapter. Chapter “Test Preps” provide comprehensive study aids to help students prepare for tests.

- **Quizzes**  Students can periodically check their progress with in-chapter quizzes that appear in all chapters, beginning with Chapter 1. All answers, with corresponding section references, appear in the student answer section. These quizzes are assignable in MyLab Math.

- **Summary Exercises**  These sets of in-chapter exercises give students the all-important opportunity to work mixed review exercises, requiring them to synthesize concepts and select appropriate solution methods.

- **End-of-Chapter Test Prep**  Following the final numbered section in each chapter, the Test Prep provides a list of Key Terms, a list of New Symbols (if applicable), and a two-column Quick Review that includes a section-by-section summary of concepts and examples. This feature concludes with a comprehensive set of Review Exercises and a Chapter Test. The Test Prep, Review Exercises, and Chapter Test are assignable in MyLab Math.
Get the Most Out of MyLab Math

Used by over 3 million students a year, MyLab Math is the world’s leading online program for teaching and learning mathematics. MyLab Math delivers assessment, tutorials, and multimedia resources that provide engaging and personalized experiences for each student, so learning can happen in any environment. Each course is developed to accompany Pearson’s best-selling content, authored by thought leaders across the math curriculum, and can be easily customized to fit any course format.

Preparedness

One of the biggest challenges in College Algebra, Trigonometry, and Precalculus is making sure students are adequately prepared with prerequisite knowledge. For a student, having the essential algebra skills upfront in a course can dramatically help increase success.

MyLab Math with Integrated Review can be used in co-requisite courses, or simply to help students who enter College Algebra without a full understanding of prerequisite skills and concepts. These courses provide videos on review topics, along with pre-made, assignable skills-check quizzes and personalized review homework assignments.

Getting Ready material provides just-in-time review, integrated throughout the course as needed to prepare students with prerequisite material to succeed. From a quick quiz, a personalized, just-in-time review assignment is generated for each student, allowing them to refresh forgotten concepts.

pearson.com/mylab/math
Resources for Success

MyLab Math Online Course for *Essentials of College Algebra*, Twelfth Edition
by Lial, Hornsby, Schneider, and Daniels (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.

**Conceptual Understanding**

It’s important for students to visualize and conceptualize difficult concepts in Precalculus. Active engagement with the material helps students internalize mathematical connections.

**Concept Preview Exercises**

Each Homework section now begins with a group of Concept Preview Exercises, assignable in MyLab Math and in Learning Catalytics. These may be used to ensure that students understand the related vocabulary and basic concepts before beginning the regular homework problems.

**MyNotes and MyClassroomExamples**

MyNotes provide a note-taking structure for students to use while they read the text or watch the MyLab Math videos. MyClassroom Examples offer structure for notes taken during lecture and are for use with the ClassroomExamples found in the Annotated Instructor’s Edition.

Both sets of notes are available in MyLab Math and can be customized by the instructor.

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. Includes helpful Teaching Tips and Classroom Examples.
- Includes sample homework assignments, assignable in MyLab Math, indicated by problem numbers underlined in blue within each end-of-section exercise set.

Online Instructor’s Solution Manual
By Beverly Fusfield Provides complete solutions to all text exercises.

Online Instructor’s Testing Manual
By David Atwood, Rochester Community and Technical College. Testing manual includes diagnostic pretests, grouped by section, with answers provided.

TestGen®
TestGen® (www.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.

Online PowerPoint® Lecture Slides and Classroom Example PowerPoints
- The PowerPoint Lecture Slides feature presentations written and designed specifically for this text, including figures and examples from the text.
- Provide Classroom Example PowerPoints that include full worked-out solutions to all Classroom Examples.

Learning Catalytics
Generate class discussion, guide your lecture, and promote peer-to-peer learning with real-time analytics. MyLab Math now provides Learning Catalytics—an interactive student response tool that uses students’ smartphones, tablets, or laptops to engage them in more sophisticated tasks and thinking.

Student Resources
Additional resources to aid student success.

Student’s Solution Manual
By Beverly Fusfield Provides detailed solutions to all odd-numbered text exercises.

Video Lectures with Optional Captioning
- Quick Reviews cover key definitions and procedures from each section.
- Example Solutions walk students through the detailed solution process for every example in the textbook.

MyNotes with Integrated Review Worksheets
Available as a printed supplement and in MyLab Math. MyNotes offer structure for students as they watch videos or read the text.
- Includes textbook examples along with ample space for students to write solutions and notes.
- Includes key concepts along with prompts for students to read, write, and reflect on what they have just learned.
- Customizable so that instructors can add their own examples or remove examples that are not covered in their course.

Integrated Review Worksheets prepare students for the College Algebra material.
- Includes key terms, Guided examples with ample space for students to work and reference where in MyLab Math to get extra help.

MyClassroomExamples
- Available in MyLab Math and offer structure for students for classroom lecture.
- Includes Classroom Examples along with ample space for students to write solutions and notes.
- Includes key concepts along with fill in the blank opportunities to keep students engaged.
- Customizable so that instructors can add their own examples or remove Classroom Examples that are not covered in their course.

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We wish to thank the following individuals who provided valuable input into this edition of the text.

Barbara Aramenta – Pima Community College  
Robert Bates – Honolulu Community College  
Troy Brachey – Tennessee Tech University  
Hugh Cornell – University of North Florida  
John E. Daniels – Central Michigan University  
Dan Fahringer – HACC Harrisburg  
Doug Grenier – Rogers State University  
Mary Hill – College of DuPage  
Keith Hubbard – Stephen Austin State University  
Christine Janowiak – Arapahoe Community College  
Tarcia Jones – Austin Community College, Rio Grande  
Rene Lumampao – Austin Community College  
Rosana Maldonado – South Texas Community College, Pecan  
Nilay S. Manzagol – Georgia State University  
Marianna McClymonds – Phoenix College  
Randy Nichols – Delta College  
Preeti Parikh – SUNY Maritime  
Deanna Robinson-Briedel – McLennan Community College  
Sutandra Sarkar – Georgia State University  
Patty Schovanec – Texas Tech University  
Jimmy Vincente – El Centro College  
Deanna M. Welsch – Illinois Central College  
Amanda Wheeler – Amarillo College  
Li Zhou – Polk State College

Our sincere thanks to those individuals at Pearson Education who have supported us throughout this revision: Anne Kelly, Christine O’Brien, Joe Vetere, and Jonathan Wooding. Terry McGinnis continues to provide behind-the-scenes guidance for both content and production. We have come to rely on her expertise during all phases of the revision process. Marilyn Dwyer of Cengage® Publishing Services, with the assistance of Carol Merrigan, provided excellent production work. Special thanks go out to Paul Lorczak and John Morin for their excellent accuracy-checking. We thank Lucie Haskins, who provided an accurate index, and Jack Hornsby, who provided assistance in creating calculator screens, researching data updates, and proofreading. We appreciate the valuable suggestions for Chapter 5 that Mary Hill of College of Dupage made during our meeting with her in March 2010.

As an author team, we are committed to providing the best possible college algebra course to help instructors teach and students succeed. As we continue to work toward this goal, we welcome any comments or suggestions you might send, via e-mail, to math@pearson.com.

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