Preface to the Instructor

As a professor of mathematics at an urban public university for 35 years, I understand the varied needs of algebra and trigonometry students. Students range from being underprepared with little mathematical background and a fear of mathematics, to being highly prepared and motivated. For some, this is their final course in mathematics. For others, it is preparation for future mathematics courses. I have written this text with both groups in mind.

A tremendous benefit of authoring a successful series is the broad-based feedback I receive from instructors and students who have used previous editions. I am sincerely grateful for their support. Virtually every change to this edition is the result of their thoughtful comments and suggestions. I hope that I have been able to take their ideas and, building upon a successful foundation of the tenth edition, make this series an even better learning and teaching tool for students and instructors.

Features in the Eleventh Edition

A descriptive list of the many special features of Algebra & Trigonometry can be found on the endpapers in the front of this text. This list places the features in their proper context, as building blocks of an overall learning system that has been carefully crafted over the years to help students get the most out of the time they put into studying. Please take the time to review it and to discuss it with your students at the beginning of your course. My experience has been that when students use these features, they are more successful in the course.

• Updated! Retain Your Knowledge Problems These problems, which were new to the previous edition, are based on the article “To Retain New Learning, Do the Math,” published in the Eduarati Review. In this article, Kevin Washburn suggests that “the more students are required to recall new content or skills, the better their memory will be.” The Retain Your Knowledge problems were so well received that they have been expanded in this edition. Moreover, while the focus remains to help students maintain their skills, in most sections, problems were chosen that preview skills required to succeed in subsequent sections or in calculus. These are easily identified by the calculus icon (\( \Delta \)). All answers to Retain Your Knowledge problems are given in the back of the text and all are assignable in MyLab Math.

• Guided Lecture Notes Ideal for online, emporium/ redesign courses, inverted classrooms, or traditional lecture classrooms. These lecture notes help students take thorough, organized, and understandable notes as they watch the Author in Action videos. They ask students to complete definitions, procedures, and examples based on the content of the videos and text. In addition, experience suggests that students learn by doing and understanding the why/how of the concept or property. Therefore, many sections will have an exploration activity to motivate student learning. These explorations introduce the topic and/or connect it to either a real-world application or a previous section. For example, when the vertical-line test is discussed in Section 3.2, after the theorem statement, the notes ask the students to explain why the vertical-line test works by using the definition of a function. This challenge helps students process the information at a higher level of understanding.

• Illustrations Many of the figures have captions to help connect the illustrations to the explanations in the body of the text.

• Graphing Utility Screen Captures In several instances we have added Desmos screen captures along with the TI-84 Plus C screen captures. These updated screen captures provide alternate ways of visualizing concepts and making connections between equations, data, and graphs in full color.

• Chapter Projects, which apply the concepts of each chapter to a real-world situation, have been enhanced to give students an up-to-the-minute experience. Many of these projects are new requiring the student to research information online in order to solve problems.

• Exercise Sets The exercises in the text have been reviewed and analyzed some have been removed, and new ones have been added. All time-sensitive problems have been updated to the most recent information available. The problem sets remain classified according to purpose.

The ‘Are You Prepared?’ problems have been improved to better serve their purpose as a just-in-time review of concepts that the student will need to apply in the upcoming section.

The Concepts and Vocabulary problems have been expanded to cover each objective of the section. These multiple-choice, fill-in-the-blank, and True/False exercises have been written to also serve as reading quizzes.

• Skill Building problems develop the student’s computational skills with a large selection of exercises that are directly related to the objectives of the section.

• Mixed Practice problems offer a comprehensive assessment of skills that relate to more than one objective. Often these require skills learned earlier in the course.

• Applications and Extensions problems have been updated. Further, many new application-type exercises have been added, especially ones involving information and data drawn from sources the student will recognize, to improve relevance and timeliness.

At the end of Applications and Extensions, we have a collection of one or more Challenge Problems. These problems, as the title suggests, are intended to be thought-provoking, requiring some ingenuity to solve. They can be used for group work or to challenge students. At the end of the Annotated Instructor’s
Edition and in the online Instructor’s Solutions Manual, we have provided solutions to all these problems.

The Explaining Concepts: Discussion and Writing exercises provide opportunity for classroom discussion and group projects.

Updated! Retain Your Knowledge has been improved and expanded. The problems are based on material learned earlier in the course. They serve to keep information that has already been learned “fresh” in the mind of the student. Answers to all these problems appear in the Student Edition.

Need to Review? These margin notes provide a just-in-time reminder of a concept needed now, but covered in an earlier section of the book. Each note includes a reference to the chapter, section and page where the concept was originally discussed.

Content Changes to the 11th edition

• Challenge Problems have been added in most sections at the end of the Application and Extensions exercises. Challenge Problems are intended to be thought-provoking problems that require some ingenuity to solve. They can be used to challenge students or for group work. Solutions to Challenge Problems are at available in the Annotated Instructor’s Edition and the online Instructors Solutions Manual.

• Need to Review? These margin notes provide a just-in-time review for a concept needed now, but covered in an earlier section of the book. Each note is back-referenced to the chapter, section and page where the concept was originally discussed.

• Additional Retain Your Knowledge exercises, whose purpose is to keep learned material fresh in a student’s mind, have been added to each section. Many of these new problems preview skills required for calculus or for concepts needed in subsequent sections.

• Desmos screen captures have been added throughout the text. This is done to recognize that graphing technology expands beyond graphing calculators.

• Examples and exercises throughout the text have been augmented to reflect a broader selection of STEM applications.

• Concepts and Vocabulary exercises have been expanded to cover each objective of a section.

• Skill building exercises have been expanded to assess a wider range of difficulty.

• Applied problems and those based on real data have been updated where appropriate.

Chapter 1

• NEW Section 1.2 Objective 2 Solve a Quadratic Equation Using the Square Root Method.

Chapter 2

• NEW Section 2.2 Example 9 Testing an Equation for Symmetry

• Section 2.3 has been reorganized to treat the slope-intercept form of the equation of a line before finding an equation of a line using two points.

Chapter 3

• NEW Section 3.1 Objective 1 Describe a Relation

• NEW Section 3.2 Example 4 Expanding Energy

• NEW Section 3.4 Example 4 Analyzing a Piecewise-defined Function

• NEW Example 1 Describing a Relation demonstrates using the Rule of Four to express a relation numerically, as a mapping, and graphically given a verbal description.

Chapter 4

• Section 4.3 introduces the concept of concavity for a quadratic function

• NEW Section 4.3 Example 3 Graphing a Quadratic Function Using Its Vertex, Axis, and Intercepts

• Section 4.3 Example 8 Analyzing the Motion of a Projectile (formerly in Section 4.4)

• NEW Section 4.4 Example 4 Fitting a Quadratic Function to Data

Chapter 5

• Section 5.1 has been revised and split into two sections:
  • 5.1 Polynomial Functions
  • 5.2 Graphing Polynomial Functions; Models

• NEW Section 5.2 Example 2 Graphing a Polynomial Function (a 4th degree polynomial function)

Chapter 6

• Section 6.2 now finds and verifies inverse functions analytically and graphically

Chapter 7

• NEW Section 7.1 Example 6 Field Width of a Digital Lens Reflex Camera Lens

• NEW Section 7.5 Example 5 Using Symmetry to Find Exact Values of Trigonometric Functions

• Section 7.6 and 7.7 were reorganized for increased clarity.

Chapter 8

• Sections 8.1 and 8.2 were reorganized for increased clarity.

Chapter 10

• Section 10.3 The complex plane; DeMoivre’s Theorem, was rewritten to support the exponential form of a complex number.
  • Euler’s Formula is introduced to express a complex number in exponential form

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The exponential form of a complex number is used to compute products and quotients.
DeMoivre’s Theorem is expressed using the exponential form of a complex number.
The exponential form is used to find complex roots

Chapter 12
• NEW Section 12.5 Example 1 Identifying Proper and Improper Rational Expressions

Using the Eleventh Edition Effectively with Your Syllabus
To meet the varied needs of diverse syllabi, this text contains more content than is likely to be covered in an Algebra & Trigonometry course. As the chart illustrates, this text has been organized with flexibility of use in mind. Within a given chapter, certain sections are optional (see the details that follow the figure below) and can be omitted without loss of continuity.

Chapter R Review
This chapter consists of review material. It may be used as the first part of the course or later as a just-in-time review when the content is required. Specific references to this chapter occur throughout the text to assist in the review process.

Chapter 1 Equations and Inequalities
Primarily a review of Intermediate Algebra topics, this material is a prerequisite for later topics. The coverage of complex numbers and quadratic equations with a negative discriminant is optional and may be postponed or skipped entirely without loss of continuity.

Acknowledgments
Textbooks are written by authors, but evolve from an idea to final form through the efforts of many people. It was Don Dellen who first suggested this text and series to me. Don is remembered for his extensive contributions to publishing and mathematics.

Thanks are due to the following people for their assistance and encouragement to the preparation of this edition:
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Finally, I offer my grateful thanks to the dedicated users and reviewers of my texts, whose collective insights form the backbone of each textbook revision.

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**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 this course can dramatically increase success.

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Author in Action Videos are actual classroom lectures by Michael Sullivan III with fully worked-out examples.

- **Video assessment** questions are available to assign in MyLab Math for key videos.
- **Updated!** The corresponding **Guided Lecture Notes** assist students in taking thorough, organized, and understandable notes while watching Author in Action videos.

Guided Visualizations

**New!** Guided Visualizations, created in GeoGebra by Michael Sullivan III, bring mathematical concepts to life, helping students visualize the concept through directed exploration and purposeful manipulation. Assignable in MyLab Math with assessment questions to check students’ conceptual understanding.

Retain Your Knowledge Exercises

**Updated! Retain Your Knowledge Exercises**, assignable in MyLab Math, improve students’ recall of concepts learned earlier in the course. New for the 11th Edition, additional exercises will be included that will have an emphasis on content that students will build upon in the immediate upcoming section.

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

Annotated Instructor's Edition
Algebra & Trigonometry, 11th Edition
ISBN – 0135190541 / 9780135190548
Shorter answers are on the page beside the exercises. Longer answers are in the back of the text.

Instructor's Solutions Manual
ISBN – 0135189322 / 9780135189320
Includes fully worked solutions to all exercises in the text.

Learning Catalytics Question Library
Questions written by Michael Sullivan III are available within MyLab Math to deliver through Learning Catalytics to engage students in your course.

Powerpoint® Lecture Slides
Fully editable slides correlate to the textbook.

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Includes additional examples and helpful teaching tips, by section.

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Online Chapter Projects
Additional projects that give students an opportunity to apply what they learned in the chapter.

Student Resources
Additional resources to enhance student success.

Lecture Video
Author in Action videos are actual classroom lectures with fully worked out examples presented by Michael Sullivan, Ill. All video is assignable within MyLab Math.

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Students can watch instructors work through step-by-step solutions to all chapter test exercises from the text. These are available in MyLab Math and on YouTube.

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