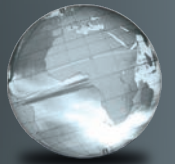


GLOBAL
EDITION



Precalculus

Eleventh Edition

Sullivan



To the Student

As you begin, you may feel anxious about the number of theorems, definitions, procedures, and equations. You may wonder if you can learn it all in time. Don't worry—your concerns are normal. This textbook was written with you in mind. If you attend class, work hard, and read and study this text, you will build the knowledge and skills you need to be successful. Here's how you can use the text to your benefit.

Read Carefully

When you get busy, it's easy to skip reading and go right to the problems. Don't ... the text has a large number of examples and clear explanations to help you break down the mathematics into easy-to-understand steps. Reading will provide you with a clearer understanding, beyond simple memorization. Read before class (not after) so you can ask questions about anything you didn't understand. You'll be amazed at how much more you'll get out of class if you do this.

Use the Features

I use many different methods in the classroom to communicate. Those methods, when incorporated into the text, are called "features." The features serve many purposes, from providing timely review of material you learned before (just when you need it) to providing organized review sessions to help you prepare for quizzes and tests. Take advantage of the features and you will master the material.

To make this easier, we've provided a brief guide to getting the most from this text. Refer to "Prepare for Class," "Practice," and "Review" at the front of the text. Spend fifteen minutes reviewing the guide and familiarizing yourself with the features by flipping to the page numbers provided. Then, as you read, use them. This is the best way to make the most of your text.


Please do not hesitate to contact me through Pearson, with any questions, comments, or suggestions for improving this text. I look forward to hearing from you, and good luck with all of your studies.

Best Wishes!

Michael Sullivan

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Prepare for Class “Read the Book”

Feature	Description	Benefit	Page
Every Chapter Opener begins with . . .			
Chapter-Opening Topic & Project	Each chapter begins with a discussion of a topic of current interest and ends with a related project.	The project lets you apply what you learned to solve a problem related to the topic.	294
 Internet-based Project	The projects allow for the integration of spreadsheet technology that you will need to be a productive member of the workforce.	The projects give you an opportunity to collaborate and use mathematics to deal with issues of current interest.	396
Every Section begins with . . .			
LEARNING OBJECTIVES 	Each section begins with a list of objectives. Objectives also appear in the text where the objective is covered.	These focus your study by emphasizing what’s most important and where to find it.	319
Sections contain . . .			
PREPARING FOR THIS SECTION	Most sections begin with a list of key concepts to review with page numbers.	Ever forget what you’ve learned? This feature highlights previously learned material to be used in this section. Review it, and you’ll always be prepared to move forward.	315
Now Work the ‘Are You Prepared?’ Problems	Problems that assess whether you have the prerequisite knowledge for the upcoming section.	Not sure you need the Preparing for This Section review? Work the ‘Are You Prepared?’ problems. If you get one wrong, you’ll know exactly what you need to review and where to review it!	315, 326
 Now Work PROBLEMS	These follow most examples and direct you to a related exercise.	We learn best by doing. You’ll solidify your understanding of examples if you try a similar problem right away, to be sure you understand what you’ve just read.	322, 327
WARNING	Warnings are provided in the text.	These point out common mistakes and help you to avoid them.	349
Exploration and Seeing the Concept	These graphing utility activities foreshadow a concept or solidify a concept just presented.	You will obtain a deeper and more intuitive understanding of theorems and definitions.	310, 335
In Words	These provide alternative descriptions of select definitions and theorems.	Does math ever look foreign to you? This feature translates math into plain English.	332
 Calculus	These appear next to information essential for the study of calculus.	Pay attention—if you spend extra time now, you’ll do better later!	90, 299, 322
SHOWCASE EXAMPLES	These examples provide “how-to” instruction by offering a guided, step-by-step approach to solving a problem.	With each step presented on the left and the mathematics displayed on the right, you can immediately see how each step is used.	261
 Model It! Examples and Problems	These examples and problems require you to build a mathematical model from either a verbal description or data. The homework Model It! problems are marked by purple headings.	It is rare for a problem to come in the form “Solve the following equation.” Rather, the equation must be developed based on an explanation of the problem. These problems require you to develop models to find a solution to the problem.	339, 368
NEW!  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 is back-referenced to the chapter, section and page where the concept was originally discussed.	Sometimes as you read, you encounter a word or concept you know you’ve seen before, but don’t remember exactly what it means. This feature will point you to where you first learned the word or concept. A quick review now will help you see the connection to what you are learning for the first time and make remembering easier the next time.	308

Practice “Work the Problems”

Feature	Description	Benefit	Page
‘Are You Prepared?’ Problems	These assess your retention of the prerequisite material you’ll need. Answers are given at the end of the section exercises. This feature is related to the Preparing for This Section feature.	Do you always remember what you’ve learned? Working these problems is the best way to find out. If you get one wrong, you’ll know exactly what you need to review and where to review it!	332, 340
Concepts and Vocabulary	These short-answer questions, mainly Fill-in-the-Blank, Multiple-Choice and True/False items, assess your understanding of key definitions and concepts in the current section.	It is difficult to learn math without knowing the language of mathematics. These problems test your understanding of the formulas and vocabulary.	326
Skill Building	Correlated with section examples, these problems provide straightforward practice.	It’s important to dig in and develop your skills. These problems provide you with ample opportunity to do so.	326–328
Applications and Extensions	These problems allow you to apply your skills to real-world problems. They also allow you to extend concepts learned in the section.	You will see that the material learned within the section has many uses in everyday life.	329–331
NEW! Challenge Problems	These problems have been added in most sections and appear at the end of the Application and Extensions exercises. They are intended to be thought-provoking, requiring some ingenuity to solve.	Are you a student who likes being challenged? Then the Challenge Problems are for you! Your professor might also choose to assign a challenge problem as a group project. The ability to work with a team is a highly regarded skill in the working world.	331
Explaining Concepts: Discussion and Writing	“Discussion and Writing” problems are colored red. They support class discussion, verbalization of mathematical ideas, and writing and research projects.	To verbalize an idea, or to describe it clearly in writing, shows real understanding. These problems nurture that understanding. Many are challenging, but you’ll get out what you put in.	331
Retain Your Knowledge	These problems allow you to practice content learned earlier in the course.	Remembering how to solve all the different kinds of problems that you encounter throughout the course is difficult. This practice helps you remember.	331
Now Work PROBLEMS	Many examples refer you to a related homework problem. These related problems are marked by a pencil and orange numbers.	If you get stuck while working problems, look for the closest Now Work problem, and refer to the related example to see if it helps.	324, 325
Review Exercises	Every chapter concludes with a comprehensive list of exercises to practice. Use the list of objectives to determine the objective and examples that correspond to the problems.	Work these problems to ensure that you understand all the skills and concepts of the chapter. Think of it as a comprehensive review of the chapter.	391–394

Review “Study for Quizzes and Tests”

Feature	Description	Benefit	Page
The Chapter Review at the end of each chapter contains . . .			
Things to Know	A detailed list of important theorems, formulas, and definitions from the chapter.	Review these and you’ll know the most important material in the chapter!	389–390
You Should Be Able to . . .	Contains a complete list of objectives by section, examples that illustrate the objective, and practice exercises that test your understanding of the objective.	Do the recommended exercises and you’ll have mastered the key material. If you get something wrong, go back and work through the objective listed and try again.	390–391
Review Exercises	These provide comprehensive review and practice of key skills, matched to the Learning Objectives for each section.	Practice makes perfect. These problems combine exercises from all sections, giving you a comprehensive review in one place.	391–394
Chapter Test	About 15–20 problems that can be taken as a Chapter Test. Be sure to take the Chapter Test under test conditions—no notes!	Be prepared. Take the sample practice test under test conditions. This will get you ready for your instructor’s test. If you get a problem wrong, you can watch the Chapter Test Prep Video.	394
Cumulative Review	These problem sets appear at the end of each chapter, beginning with Chapter 2. They combine problems from previous chapters, providing an ongoing cumulative review. When you use them in conjunction with the Retain Your Knowledge problems, you will be ready for the final exam.	These problem sets are really important. Completing them will ensure that you are not forgetting anything as you go. This will go a long way toward keeping you primed for the final exam.	395
Chapter Projects	The Chapter Projects apply to what you’ve learned in the chapter. Additional projects are available on the Instructor’s Resource Center (IRC).	The Chapter Projects give you an opportunity to use what you’ve learned in the chapter to the opening topic. If your instructor allows, these make excellent opportunities to work in a group, which is often the best way to learn math.	396
 Internet-Based Projects	In selected chapters, a Web-based project is given.	These projects give you an opportunity to collaborate and use mathematics to deal with issues of current interest by using the Internet to research and collect data.	396

*To the Memory of
My Mother and Father*

Precalculus

Eleventh Edition

Global Edition

Michael Sullivan

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11.5 Partial Fraction Decomposition	812
Decompose $\frac{P}{Q}$ Where Q Has Only Nonrepeated Linear Factors • Decompose $\frac{P}{Q}$ Where Q Has Repeated Linear Factors • Decompose $\frac{P}{Q}$ Where Q Has a Nonrepeated Irreducible Quadratic Factor • Decompose $\frac{P}{Q}$ Where Q Has a Repeated Irreducible Quadratic Factor	
11.6 Systems of Nonlinear Equations	821
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11.7 Systems of Inequalities	830
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Set Up a Linear Programming Problem • Solve a Linear Programming Problem	
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12.2 Arithmetic Sequences	862
Determine Whether a Sequence Is Arithmetic • Find a Formula for an Arithmetic Sequence • Find the Sum of an Arithmetic Sequence	
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Cumulative Review	894
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13 Counting and Probability 896

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14 A Preview of Calculus: The Limit, Derivative, and Integral of a Function 926

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Investigate a Limit Using a Table • Investigate a Limit Using a Graph	
14.2 Algebraic Techniques for Finding Limits	932
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14.4 The Tangent Problem; The Derivative	945
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Appendix A

Review

A1

A.1 Algebra Essentials

A1

Work with Sets • Graph Inequalities • Find Distance on the Real Number Line • Evaluate Algebraic Expressions • Determine the Domain of a Variable • Use the Laws of Exponents • Evaluate Square Roots • Use a Calculator to Evaluate Exponents

A.2 Geometry Essentials

A14

Use the Pythagorean Theorem and Its Converse • Know Geometry Formulas • Understand Congruent Triangles and Similar Triangles

A.3 Polynomials

A22

Recognize Monomials • Recognize Polynomials • Know Formulas for Special Products • Divide Polynomials Using Long Division • Factor Polynomials • Complete the Square

A.4 Synthetic Division

A31

Divide Polynomials Using Synthetic Division

A.5 Rational Expressions

A35

Reduce a Rational Expression to Lowest Terms • Multiply and Divide Rational Expressions • Add and Subtract Rational Expressions • Use the Least Common Multiple Method • Simplify Complex Rational Expressions

A.6 Solving Equations

A44

Solve Equations by Factoring • Solve Equations Involving Absolute Value • Solve a Quadratic Equation by Factoring • Solve a Quadratic Equation by Completing the Square • Solve a Quadratic Equation Using the Quadratic Formula

A.7 Complex Numbers; Quadratic Equations in the Complex Number System

A54

Add, Subtract, Multiply, and Divide Complex Numbers • Solve Quadratic Equations in the Complex Number System

A.8 Problem Solving: Interest, Mixture, Uniform Motion, Constant Rate Job Applications

A62

Translate Verbal Descriptions into Mathematical Expressions • Solve Interest Problems • Solve Mixture Problems • Solve Uniform Motion Problems • Solve Constant Rate Job Problems

A.9 Interval Notation; Solving Inequalities

A72

Use Interval Notation • Use Properties of Inequalities • Solve Inequalities • Solve Combined Inequalities • Solve Inequalities Involving Absolute Value

A.10 n th Roots; Rational Exponents

A83

Work with n th Roots • Simplify Radicals • Rationalize Denominators and Numerators • Solve Radical Equations • Simplify Expressions with Rational Exponents

Appendix B

Graphing Utilities

B1

B.1 The Viewing Rectangle

B1

B.2 Using a Graphing Utility to Graph Equations

B3

B.3 Using a Graphing Utility to Locate Intercepts and Check for Symmetry

B5

B.4 Using a Graphing Utility to Solve Equations

B6

B.5 Square Screens

B8

B.6 Using a Graphing Utility to Graph Inequalities	B9
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Subject Index	I1

Three Distinct Series

Students have different goals, learning styles, and levels of preparation. Instructors have different teaching philosophies, styles, and techniques. Rather than write one series to fit all, the Sullivans have written three distinct series. All share the same goal—to develop a high level of mathematical understanding and an appreciation for the way mathematics can describe the world around us. The manner of reaching that goal, however, differs from series to series.

Flagship Series, Eleventh Edition

The Flagship Series is the most traditional in approach yet modern in its treatment of precalculus mathematics. In each text, needed review material is included, and is referenced when it is used. Graphing utility coverage is optional and can be included or excluded at the discretion of the instructor: *College Algebra*, *Algebra & Trigonometry*, *Trigonometry: A Unit Circle Approach*, *Precalculus*.

Enhanced with Graphing Utilities Series, Seventh Edition

This series provides a thorough integration of graphing utilities into topics, allowing students to explore mathematical concepts and encounter ideas usually studied in later courses. Many examples show solutions using algebra side-by-side with graphing techniques. Using technology, the approach to solving certain problems differs from the Flagship Series, while the emphasis on understanding concepts and building strong skills is maintained: *College Algebra*, *Algebra & Trigonometry*, *Precalculus*.

Concepts through Functions Series, Fourth Edition

This series differs from the others, utilizing a functions approach that serves as the organizing principle tying concepts together. Functions are introduced early in various formats. The approach supports the Rule of Four, which states that functions can be represented symbolically, numerically, graphically, and verbally. Each chapter introduces a new type of function and then develops all concepts pertaining to that particular function. The solutions of equations and inequalities, instead of being developed as stand-alone topics, are developed in the context of the underlying functions. Graphing utility coverage is optional and can be included or excluded at the discretion of the instructor: *College Algebra*; *Precalculus, with a Unit Circle Approach to Trigonometry*; *Precalculus, with a Right Triangle Approach to Trigonometry*.

The Flagship Series

College Algebra, Eleventh Edition

This text provides a contemporary approach to college algebra, with three chapters of review material preceding the chapters on functions. Graphing calculator usage is provided, but is optional. After completing this book, a student will be adequately prepared for trigonometry, finite mathematics, and business calculus.

Algebra & Trigonometry, Eleventh Edition

This text contains all the material in *College Algebra*, but also develops the trigonometric functions using a right triangle approach and shows how it relates to the unit circle approach. Graphing techniques are emphasized, including a thorough discussion of polar coordinates, parametric equations, and conics using polar coordinates. Vectors in the plane, sequences, induction, and the binomial theorem are also presented. Graphing calculator usage is provided, but is optional. After completing this book, a student will be adequately prepared for finite mathematics, business calculus, and engineering calculus.

Precalculus, Eleventh Edition

This text contains one review chapter before covering the traditional precalculus topics of polynomial, rational, exponential, and logarithmic functions and their graphs. The trigonometric functions are introduced using a unit circle approach and showing how it relates to the right triangle approach. Graphing techniques are emphasized, including a thorough discussion of polar coordinates, parametric equations, and conics using polar coordinates. Vectors in the plane and in space, including the dot and cross products, sequences, induction, and the binomial theorem are also presented. Graphing calculator usage is provided, but is optional. The final chapter provides an introduction to calculus, with a discussion of the limit, the derivative, and the integral of a function. After completing this book, a student will be adequately prepared for finite mathematics, business calculus, and engineering calculus.

Trigonometry: a Unit Circle Approach, Eleventh Edition

This text, designed for stand-alone courses in trigonometry, develops the trigonometric functions using a unit circle approach and shows how it relates to the right triangle approach. Vectors in the plane and in space, including the dot and cross products, are presented. Graphing techniques are emphasized, including a thorough discussion of polar coordinates, parametric equations, and conics using polar coordinates. Graphing calculator usage is provided, but is optional. After completing this book, a student will be adequately prepared for finite mathematics, business calculus, and engineering calculus.

Preface to the Instructor

As a professor of mathematics at an urban public university for 35 years, I understand the varied needs of precalculus 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 *Precalculus* can be found 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 *Eurati 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 (\int). 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 2.2, 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.

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, especially calculus-related material. They serve to keep information that has already been learned “fresh” in the mind of the student.

NEW 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.
- **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.

Appendix A

- Section A.10 Objective 3 now includes rationalizing the numerator
 - NEW Example 6 Rationalizing Numerators
 - Problems 69-76 provide practice.
- Section A.10 Exercises now include more practice in simplifying radicals

Chapter 1

- NEW Section 1.2 Example 9 Testing an Equation for Symmetry

- Section 1.3 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 2

- NEW Section 2.1 Objective 1 Describe a Relation
- NEW Section 2.2 Example 4 Expending Energy
- NEW Section 2.4 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 3

- Section 3.3 introduces the concept of concavity for a quadratic function
- NEW Section 3.3 Example 3 Graphing a Quadratic Function Using Its Vertex, Axis, and Intercepts
- Section 3.3 Example 8 Analyzing the Motion of a Projectile (formerly in Section 3.4)
- NEW Section 3.4 Example 4 Fitting a Quadratic Function to Data

Chapter 4

- Section 4.1 has been revised and split into two sections:
 - 4.1 Polynomial Functions
 - 4.2 Graphing Polynomial Functions; Models
- NEW Section 4.2 Example 2 Graphing a Polynomial Function (a 4th degree polynomial function)

Chapter 5

- Section 5.2 now finds and verifies inverse functions analytically and graphically.

Chapter 6

- NEW Section 6.1 Example 6 Field Width of a Digital Lens Reflex Camera Lens
- Section 6.4 and 6.5 were reorganized for increased clarity.

Chapter 7

- Sections 7.1 and 7.2 were reorganized for increased clarity.

Chapter 9

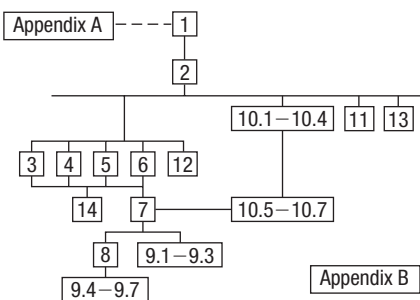
- Section 9.3 The complex plane; DeMoivre’s Theorem, was rewritten to support the exponential form of a complex number.
 - Euler’s Formula is introduced to express a complex number in exponential form.
 - The exponential form of a complex number is used to compute products and quotients.
 - DeMoivre’s Theorem is expressed using the exponential form of a complex number.
 - The exponential form is used to find complex roots.

Chapter 11

- NEW Section 11.5 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 a *Precalculus* 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.



Appendix A 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 Graphs

This chapter lays the foundation for functions.

Chapter 2 Functions and Their Graphs

Perhaps the most important chapter. Section 2.6 is optional.

Chapter 3 Linear and Quadratic Functions

Topic selection depends on your syllabus. Sections 3.2 and 3.4 may be omitted without loss of continuity.

Acknowledgments

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Chapter 4 Polynomial and Rational Functions

Topic selection depends on your syllabus.

Chapter 5 Exponential and Logarithmic Functions

Sections 5.1–5.6 follow in sequence. Sections 5.7, 5.8, and 5.9 are optional.

Chapter 6 Trigonometric Functions

Section 6.6 may be omitted in a brief course.

Chapter 7 Analytic Trigonometry

Section 7.7 may be omitted in a brief course.

Chapter 8 Applications of Trigonometric Functions

Sections 8.4 and 8.5 may be omitted in a brief course.

Chapter 9 Polar Coordinates; Vectors

Sections 9.1–9.3 and Sections 9.4–9.7 are independent and may be covered separately.

Chapter 10 Analytic Geometry

Sections 10.1–10.4 follow in sequence. Sections 10.5, 10.6, and 10.7 are independent of each other, but each requires Sections 10.1–10.4.

Chapter 11 Systems of Equations and Inequalities

Sections 11.2–11.7 may be covered in any order, but each requires Section 11.1. Section 11.8 requires Section 11.7.

Chapter 12 Sequences; Induction; The Binomial Theorem

There are three independent parts: Sections 12.1–12.3; Section 12.4; and Section 12.5.

Chapter 13 Counting and Probability

The sections follow in sequence.

Chapter 14 A Preview of Calculus: The Limit, Derivative, and Integral of a Function

If time permits, coverage of this chapter will give your students a beneficial head start in calculus.

liaison between the compositor and author; Peggy Lucas and Stacey Sveum for their genuine interest in marketing this text. Marcia Horton for her continued support and genuine interest; Paul Corey for his leadership and commitment to excellence; and the Pearson Sales team, for their continued confidence and personal support of Sullivan texts.

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Get the Most Out of MyLab Math

Math courses are continuously evolving to help today’s students succeed. It’s more challenging than ever to support students with a wide range of backgrounds, learner styles, and math anxieties. The flexibility to build a course that fits instructors’ individual course formats—with a variety of content options and multimedia resources all in one place—has made MyLab Math the market-leading solution for teaching and learning mathematics since its inception.

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.

- **MyLab Math with Integrated Review** can be used in corequisite courses, or simply to help students who enter without a full understanding of prerequisite skills and concepts. **Integrated Review** provides videos on review topics with a corresponding worksheet, along with premade, assignable skills-check quizzes and personalized review homework assignments. **Integrated Review** is now available within all Sullivan 11th Edition MyLab Math courses.

Assignments	
10/18/19 11:59pm	 Chapter 4 Skills Check
10/18/19 11:59pm	  Chapter 4 Skills Review Homework
04/01/20 11:59pm	 Chapter 5 Skills Check
04/01/20 11:59pm	  Chapter 5 Skills Review Homework
09/14/20 11:59pm	 Chapter 6 Skills Check
09/14/20 11:59pm	  Chapter 6 Skills Review Homework

Resources for Success

MyLab Math Online Course for Precalculus,

11th Edition by Michael Sullivan (access code required)

MyLab™ Math is tightly integrated with each author's style, offering a range of author-created multimedia resources, so your students have a consistent experience.

Video Program and Resources

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.

EXAMPLE

Finding the Exact Value of a Logarithmic Expression

(a) $\log_3 81 = 4$ (b) $\log_2 \frac{1}{8}$

$y = \log_a x$ means $a^y = x$

(b) $y = \log_2 \frac{1}{8}$

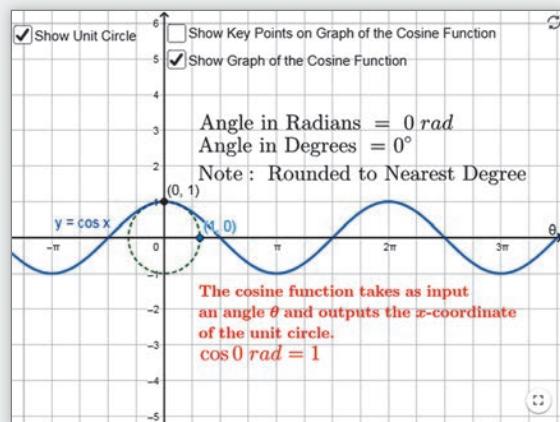
$2^y = \frac{1}{8}$

$2^y = 2^{-3}$

$y = -3$

$2^y = 2$

03:27 / 04:07



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.

Retain Your Knowledge

Problems 154–162 are based on material learned earlier in the course. The purpose of these problems is to keep the material fresh in your mind so that you are better prepared for the final exam.

154. Simplify $\left(\frac{x^2y^{-3}}{x^3y}\right)^{-2}$. Assume $x \neq 0$ and $y \neq 0$. Express the answer so that all exponents are positive. $x^{\frac{12}{5}}y^{\frac{18}{5}}$

155. The lengths of the legs of a right triangle are $a = 8$ and $b = 15$. Find the hypotenuse. 17

156. Solve the equation: $(x - 3)^2 + 25 = 49$
 $\{1 - 2\sqrt{6}, 3 + 2\sqrt{6}\}$

157. Solve $|2x - 5| + 7 < 10$. Express the answer using set notation or interval notation. Graph the solution set.

158. Determine the domain of the variable x in the expression:
 $\sqrt{8 - \frac{2}{3}x}$ $[-\infty, 12]$

159. Determine what number should be added to complete the square:
 $x^2 + \frac{3}{4}x$ $\frac{9}{64}$

160. Multiply and simplify the result.
 $\frac{x^2 - 16}{x^2 + 6x + 8} \cdot \frac{x + 2}{16 - 4x}$ $-\frac{1}{4}$

161. Rationalize the denominator:
 $\frac{\sqrt{x+1} + \sqrt{x}}{\sqrt{x+1} - \sqrt{x}}$ $\frac{2x+1 + 2\sqrt{x(x+1)}}{2x+1 - 2\sqrt{x(x+1)}}$

162. Solve: $x - 5\sqrt{x} + 6 = 0$ $\{4, 9\}$

Resources for Success

Instructor Resources

Online resources can be downloaded from the Instructor Resource Center.

Instructor's Solutions Manual

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.

Mini Lecture Notes

Includes additional examples and helpful teaching tips, by section.

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 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, III. All video is assignable within MyLab Math.

Chapter Test Prep Videos

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.

Guided Lecture Notes

These lecture notes assist students in taking thorough, organized, and understandable notes while watching Author in Action videos. Students actively participate in learning the how/why of important concepts through explorations and activities. The Guided Lecture Notes are available as PDF's and customizable Word files in MyLab Math. They can also be packaged with the text and the MyLab Math access code.

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