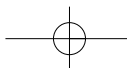
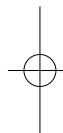
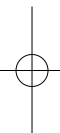


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Essentials of
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with Calculus Previews

SIXTH EDITION

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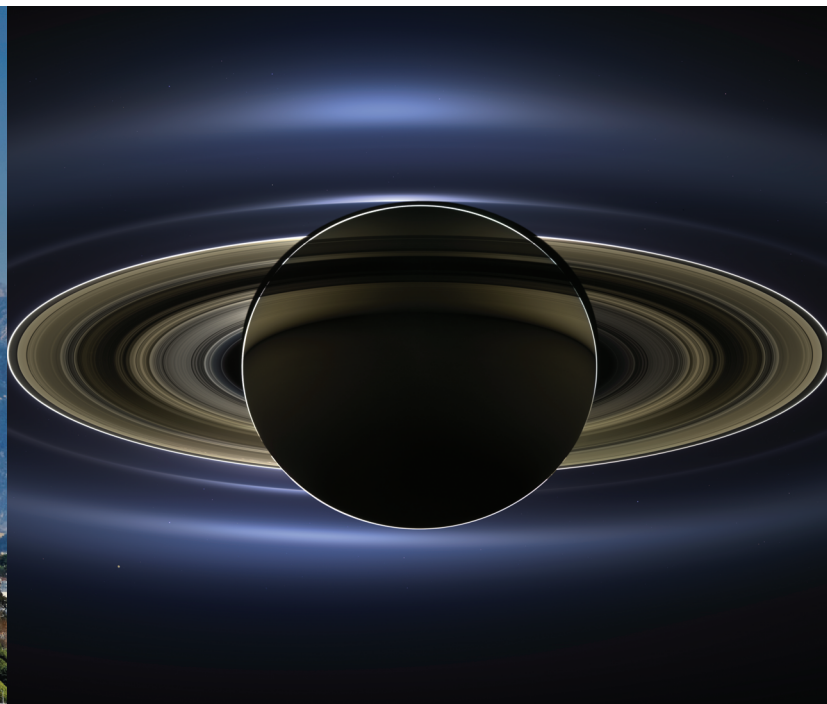


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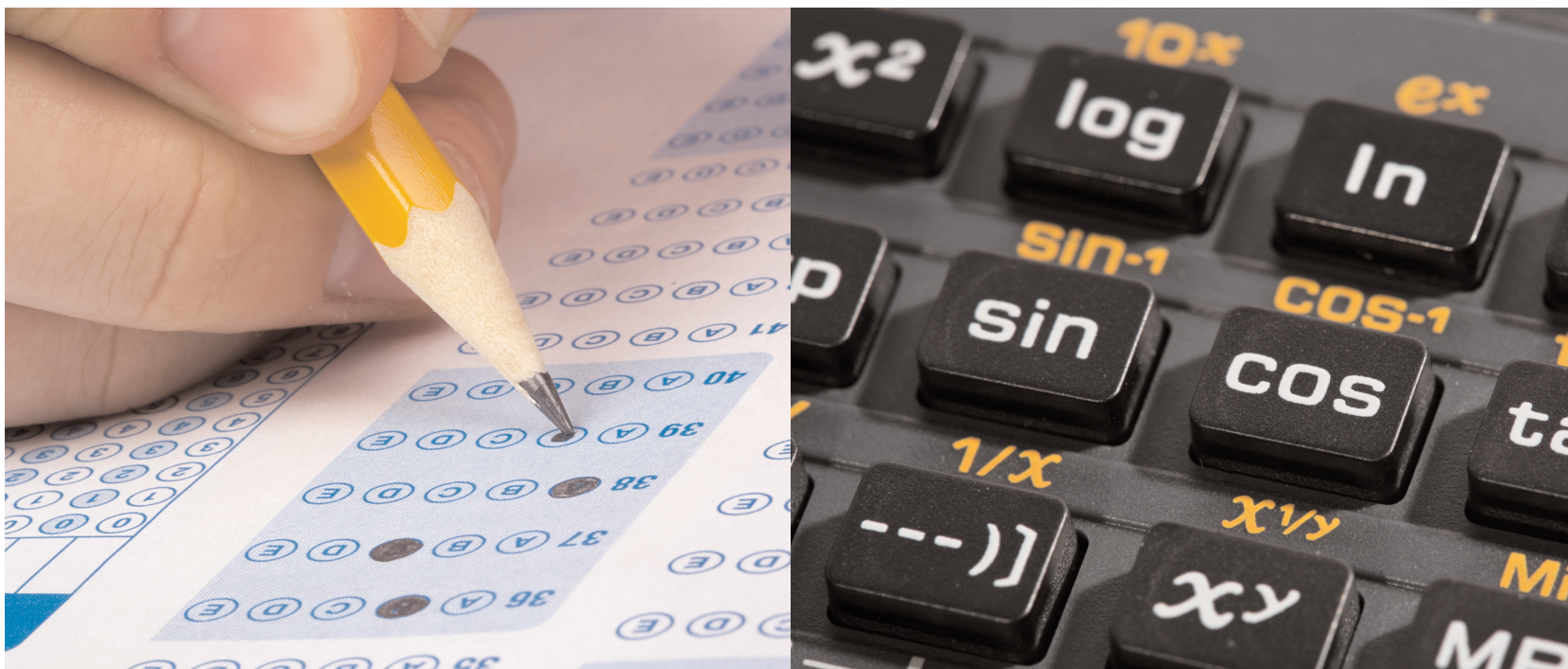
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Preface

To the Instructor

□ About This Text

As the first word in the title implies, *Essentials of Precalculus with Calculus Previews* 6e is the shorter of our two precalculus texts published by Jones & Bartlett Learning. In this text we have deliberately kept the coverage to a reasonable number of topics to allow time for instructors to work with their students to strengthen their algebraic, logarithmic, and trigonometric skills and yet cover most of the material in a one-term course. Instructors wishing a wider variety of topics such as systems of equations, sequences, series, mathematical induction, and principles of counting are referred to our *Precalculus with Calculus Previews* 5e.

Emphases The focus of this text is squarely on basic mathematics encountered in a typical calculus course. Many times we have seen students in a calculus class perform an operation such as differentiation of a function flawlessly, but fail to complete the problem successively because of difficulties in simplifying the resulting expression or in solving a related equation. So in this new edition we continue to emphasize the function concept while making an additional effort to reinforce algebraic and trigonometric skills. Through the many examples and numerous and varied exercises, we provide opportunities for students to practice operations such as factoring, expanding a power of a binomial, completing the square, synthetic and long division, rationalization, and solving inequalities and equations in situations similar to those they will encounter in calculus. Throughout we stress the importance of being familiar with key formulas from algebra, the laws of exponents, the laws of logarithms, and fundamental trigonometric definitions and identities. Marginal side notes and in-text annotations fill in the details of solutions of examples and convey additional information to the reader.

Notes from the Classroom Selected sections of this text conclude with remarks called *Notes from the Classroom*. These remarks are aimed directly at the student and address a variety of student/textbook/classroom/calculus issues such as alternative terminology, reinforcement of important concepts, what material is or is not recommended for memorization, misinterpretations, common errors, solution procedures, calculators, and advice on the importance of neatness and organization.

Calculus Previews Each of the six chapters in this text concludes with a section subtitled *Calculus Previews*. Each of these special sections is devoted to a single calculus concept (for example, *The Tangent Line Problem*). The discussion of these topics is kept at a level easily within the reach of a precalculus student. The emphasis in these previews is *not* on the calculus; the calculus topic provides a framework and motivation for the precalculus mathematics used in the discussion. The focus in these sections is on the algebraic, logarithmic, and trigonometric manipulations that are necessary for the successful completion of typical calculus problems related to the *Calculus Preview* topic. We wish to emphasize that the limit concept covered in the *Calculus Preview* for Chapter 1 does not impinge (except for a few words and the arrow notation) on other sections in the text. We also realize that the introduction to limits in Section 1.5 may be a bit ambitious for some classes. However, we feel that the algebra discussed in that section (factoring, binomial expansions, rationalization of a denominator, and so on) should be covered, but the discussion of the

limit concept could be postponed and taught, perhaps in conjunction with Section 2.10, at a more appropriate time in the course. Thus, in Exercises 1.5 most of the problems are given in (a) and (b) format, where the part (a) of the problem involves algebra and part (b) is optional because it involves a limit. Of course, all the *Calculus Previews* could be delayed to the end of the course providing a bridge to a subsequent course in calculus. If time does not allow, these topics could be covered lightly or skipped entirely.

Gradual Use of Calculus Terminology Calculus-related words such as “continuous function” are used where appropriate. The idea is to give the student a good intuitive sense of what these words mean prior to their exposure to their formal definitions in calculus.

Building Functions from Words As teachers we know that the related rate and applied max-min, or optimization, problems can be a discouraging experience for some students of calculus. Correctly interpreting the words of such a problem in order to set up an equation or a function is a challenge for many students. It follows then that it is appropriate to emphasize such material in a precalculus course. In Section 2.9, entitled *Building a Function from Words*, we begin by illustrating how to translate a verbal description into a symbolic representation of a function. We then present actual problems taken from *Calculus 4e* by Dennis G. Zill and Warren S. Wright (Jones & Bartlett Learning, 2011), and demonstrate how to analyze the statement of the problem and transform those words into an objective function. We discuss the importance of drawing pictures, using variables to describe pertinent quantities, identifying a constraint between the variables, using the constraint to eliminate an extra variable, and observing that the domain of the objective function may not be the same as its implicit domain. To ensure that the focus is squarely on the process of fashioning a symbolic function from the words, we do not discuss how such optimization problems are actually solved.

Exercises The exercise sets contain a wide variety of different kinds of problems. In addition to the usual drill and applied problems, many of the exercise sets conclude with conceptual problems that are labeled *For Discussion*. We hope that instructors will utilize these problems, which are primarily conceptual in nature, and their expertise to engage in a classroom exchange of ideas with the students on how these problems can be solved. These problems could also be the basis for assigned writing projects. To encourage original thought we purposely have not included answers to these problems.

Final Examination Following the six chapters of the text we present a list of 70 questions called the *Final Examination*. This “test” consists of fill in the blank questions, true/false questions, and exercises that review topics in the six chapters of the text. It was not our intention to emulate an actual final examination in a precalculus course, rather our thought was to offer a vehicle for an informal wrap-up of the entire course. We suggest that a part of a class period be devoted to a discussion of these questions to help students prepare for their actual final examination and their subsequent transition to calculus. To facilitate the students’ review, the answers of the *Final Examination* are given both in the *Student Resource Manual* as well as in the instructor’s *Complete Solutions Manual*. Of course, the instructor is free to utilize this material in whatever manner he/she chooses (including ignoring it completely).

New to the Sixth Edition

Here are the changes made to the previous edition.

- A new section on implicitly defined functions has been added to Chapter 2 (Section 2.7). Although this topic was touched on in the fifth edition, we felt that it deserved a special consideration given its importance in calculus and in the definition of an inverse function.
- Many sections have been partially rewritten to improve their clarity.
- By request, additional examples and figures were inserted to improve the readability of the text.
- A discussion of the area of a circular sector has been added to Chapter 4 (Section 4.1).
- By request, problems on verification of trigonometric identities have been added to Chapter 4 (Exercises 4.5).
- A new section on the Product-to-Sum and Sum-to-Product trigonometric identities has been added to Chapter 4 (Section 4.6). This material was added because these formulas are arguably useful in solving certain kinds of trigonometric equations and in calculus when techniques of integration are studied.
- To reinforce the definitions of the inverse trigonometric functions, the discussion of trigonometric equations (Section 4.8) has been placed after the coverage of these inverse functions (Section 4.7).
- The discussion of applications of right triangles has been expanded and given its own section (Section 4.11).
- We felt that covering both Laws of Sines and the Law of Cosines in one section was asking a lot of the student. So these topics now are discussed in separate sections (Sections 4.12 and 4.13).
- The Chapter Review Exercises have been partitioned into three parts: A (fill in the blanks), B (true/false), and C (exercises).
- We did not think that there was a sufficient emphasis of solving equations involving exponential and logarithmic functions in the previous edition. As a consequence, exponential and logarithmic equations are now covered in a separate section (Section 5.3).
- Most of the exercise sets have been updated and many new problems have been added. We also feel that the problems added to the sections on triangle trigonometry and to the section on exponential and logarithmic models may be of particular interest (Exercises 4.11, Chapter 4 Review Exercises, Exercises 5.4).
- The *Final Examination* at the end of the text has been expanded.

Supplements for the Instructor

The following materials are available online at

go.jblearning.com/precalc6e

Complete Solutions Manual (CSM) prepared by Warren S. Wright provides worked-out solutions for every problem in the text as well as answers to all questions in the *Final Examination*.

Computerized Testing System or both Mac OS® and Windows® computer operating systems. This testing system allows instructors to create customized quizzes and tests. The questions and answers are sorted by chapter and can be easily installed on a computer. Publisher-supplied .rtf files can also be uploaded to the instructor's learning management system.

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□ Supplements for the Student

Student Resource Manual (SRM) prepared by Warren S. Wright. Unlike the traditional student solutions manual, where a selected subset of the problems are worked out, the *SRM* is divided into five parts: *Algebra Topics*, *Use of a Calculator*, *Basic Skills*, *Selected Solutions*, and *Answers to the Final Examination*. In *Algebra Topics*, selected topics from algebra (such as multiplication of an inequality by an unknown, implicit conditions in a word problem, Pascal's triangle, factoring techniques, binomial expansions, rationalizations of numerators and denominators, adding symbolic fractions, long division of polynomials, synthetic division of polynomials, factorial notation, and so on) are reviewed because of their relevance to calculus. Because we do not discuss how to use technology within the text proper, we have devoted the section *Use of a Calculator* to the review of graphing calculator essentials. In *Selected Solutions*, a detailed solution of every third problem in the exercise sets is given. *Answers to the Final Examination* is a list of answers for all the questions in the *Final Examination*.

Available in both print and online formats, this student manual can be purchased separately or ordered bundled with the textbook at a substantial savings.

Exploring Mathematics: Solving Problems with the TI-84 Plus Graphing Calculator by Jeffery M. Gervasi, Ed.D., Porterville College, Porterville, CA is a graphing calculator manual that can be ordered either through the bookstore or online directly from Jones & Bartlett Learning.

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To the Student

After teaching collegiate mathematics for many years, we have seen almost every type of student, from a budding genius who invented his own calculus, to students who struggled to master the most rudimentary mechanics of the subject. Frequently the source of difficulty in calculus can be traced to weak algebra skills or an inadequate background in trigonometry. Calculus builds immediately on your prior knowledge and skills because there is much new ground to be covered. Consequently there is very little time to review precalculus mathematics in the calculus classroom. So those who teach calculus must assume that you can factor, simplify and solve equations, solve inequalities, handle absolute-value equations and inequalities, use a calculator, correctly apply the laws of exponents, find equations of lines, plot points, sketch basic graphs, and apply important trigonometric and logarithmic identities. The ability to do algebra and trigonometry, work with exponentials and logarithms, and sketch *by hand* basic graphs quickly and accurately, are keys to success in a calculus course.

In this text we have tried to give you as much help as possible within the confines of the printed page using such features as marginal annotations, arrow annotations within examples, notes of caution, *Notes From the Classroom*, and the *Final Examination*. The many marginal and in-text annotations provide additional information or further explanation of the steps in the solution of an example. The *Student Resource Manual* (described above) was written just for you. It contains review material not found in the text, extra examples, information on calculators, solutions of problems, and answers to the *Final Examination*.

Those of us who teach and write mathematics texts strive to communicate clearly *how* to do mathematics. This text reflects our philosophy that a mathematics text for the beginning college/university level should be readable, straightforward, and loaded with motivation. The principal reason for studying precalculus is to become well-prepared for calculus. To show you how the material covered in this text is essential for success in calculus, we end each chapter with a section called *Calculus Preview*. In each of these previews a calculus problem provides a framework and motivation for precalculus mathematics and shows you how this mathematics plays a vital role in solving the problem.

Finally, we caution you that *learning* mathematics is not like learning how to ride a bicycle, that once learned, the ability sticks for a lifetime. Mathematics is more like learning another language or learning to play a musical instrument; it requires time and effort to memorize basic formulas and to understand when and how to apply them, and most importantly, it requires a lot of practice to develop and maintain proficiency. Even experienced musicians practice the fundamental scales before playing their instrument. So ultimately, you the student can learn mathematics (that is, make it stick) only through the hard work of doing mathematics.

We wish you the best of luck in this preparatory course and in your subsequent study of calculus.

Acknowledgments

We would like to take this opportunity to extend our heartfelt thanks to everyone at Jones & Bartlett Learning who were involved in the production of this text. But a special appreciation goes to our editor Laura Pagluica, and to Tiffany Sliter who, in addition to her real jobs as Senior Production Editor and endless-meetings attendee, once again guided the manuscript through the shoals of production with skill and unflagging patience.

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Marwan Abu-Sawwa, Florida State College at Jacksonville

We end with our usual apology for any mathematical or typographical errors that you may find in the text. These are the sole fault of the authors. In order to correct errors expeditiously, please send them directly to our editor at:

LPagluica@jblearning.com

Dennis G. Zill



Jacqueline M. Dewar



