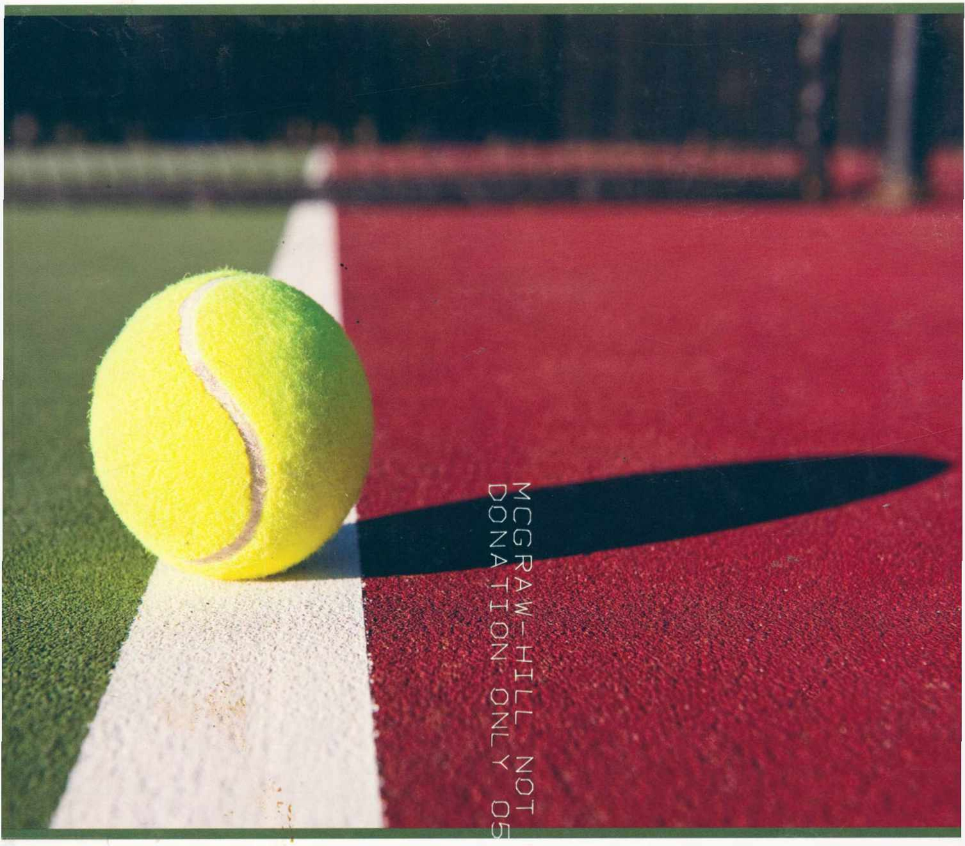
Julie Miller



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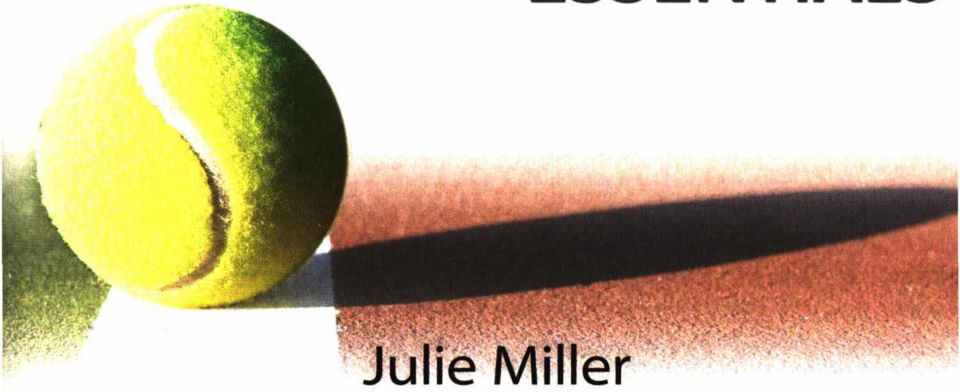

Julie Miller
Daytona State College

Digital Author
Donna Gerken
Miami Dade College

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COLLEGE ALGEBRA ESSENTIALS

Published by McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY 10020.

This book is printed on acid-free paper.

3 4 5 6 7 8 9 0 DOW/DOW 1 0 9 8 7 6 5

ISBN 978–0–07–803561–6
MHID 0–07–803561–9

ISBN 978–0–07–753834–7 (Annotated Instructor's Edition)
MHID 0–07–753834–X

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Lead Content Licensing Specialist: *Carrie K. Burger*
Compositor: *Aptara®, Inc.*
Typeface: *10.5/12 Times Lt Std*
Printer: *R. R. Donnelley*

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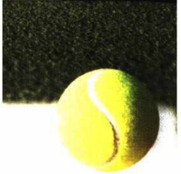
Library of Congress Cataloging-in-Publication Data

Miller, Julie, 1962- author.
College algebra essentials / Julie Miller, Daytona State College at Daytona Beach. – First edition.
pages ; cm
Includes index.
ISBN 978–0–07–803561–6 — ISBN 0–07–803561–9 (hard copy : acid-free paper)
ISBN 978–0–07–753834–7 — ISBN 0–07–753834–X (annotated instructor's edition) 1. Algebra–Textbooks. I. Title.
QA154.3.M544 2014
512.9–dc23

2012019639

www.mhhe.com



About the Authors

Julie Miller is from Daytona State College where she has taught developmental and upper-level mathematics courses for 20 years. Prior to her work at DSC, she worked as a software engineer for General Electric in the area of flight and radar simulation. Julie earned a bachelor of science in applied mathematics from Union College in Schenectady, New York, and a master of science in mathematics from the University of Florida. In addition to this textbook, she has authored eight textbooks in developmental mathematics, several course supplements for trigonometry and precalculus, as well as several short works of fiction and nonfiction for young readers.

"My father is a medical researcher, and I got hooked on math and science when I was young and would visit his laboratory. I remember doing simple calculations with him and using graph paper to plot data points for his experiments. He would then tell me what the peaks and features in the graph meant in the context of his experiment. I think that applications and hands-on experience made math come alive for me, and I'd like to see math come alive for my students."

Donna Gerken is currently a professor at Miami Dade College where she has taught developmental courses, honors classes, and upper-level mathematics classes for 30 years. Throughout the years, she has been involved with many projects at Miami Dade on curriculum redesign and the use of technology in the classroom. Donna's bachelor of science in mathematics and master of science in mathematics are both from the University of Miami. Before finishing her undergraduate and graduate degrees at the University of Miami, she also attended Miami Dade College as a student where she discovered an amazing group of faculty who inspired her to continue on with a career in mathematics.

Donna has kept a quote for many years that was passed along from one of her undergraduate professors:

> *Pure mathematics is, in its way, the poetry of logical ideas.*
>
> —Albert Einstein, in a letter to the editor of the New York Times upon the death of Emmy Noether.

If Donna is not in the classroom or peering into her computer screen, she can be found reading, in her kitchen cooking for crowds, or working out with friends at the gym.

Letter from the Authors

For many students, college algebra is a daunting course that serves as a gateway between developmental math and the realm of higher level mathematics taken by engineers and scientists. For this reason many years ago, we began writing a series of textbooks to bridge the gap between preparatory courses and the more abstract world of college algebra. For thousands of students, the Miller/O'Neill/Hyde textbook series has provided a solid foundation in intermediate algebra. Now, we want to address student needs on the other side of the bridge. Our goal is to carry the clear, concise writing style and popular pedagogical features of our textbooks to college algebra students.

The main objectives of this college algebra textbook are threefold:

- To provide students with a clear and logical presentation of the basic concepts that will prepare them for continued study in mathematics.
- To help students develop logical thinking and problem-solving skills that will benefit them in all aspects of life.
- To motivate students by demonstrating the significance of mathematics in their lives through practical applications.

Julie Miller julie.miller.math@gmail.com

Donna Gerken dgerken@mdc.edu

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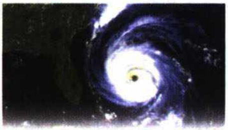


CHAPTER 4 Exponential and Logarithmic Functions 431

CHAPTER 5

Key Features

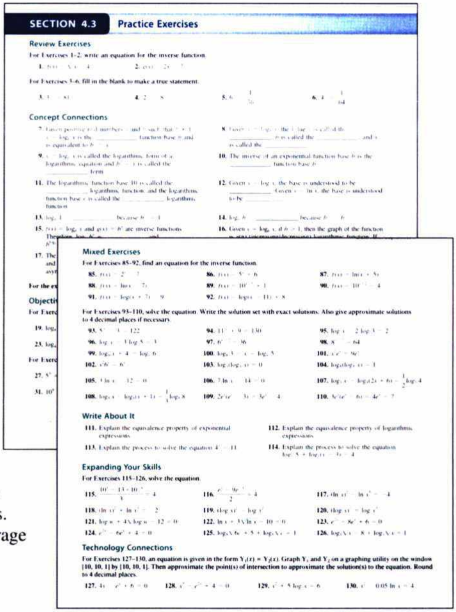
Clear, Precise Writing

Because a diverse group of students take this course, Julie Miller has written this manuscript to use simple and accessible language. Through her friendly and engaging writing style, students are able to understand the material easily.

Exercise Sets

The exercises at the end of each section are graded, varied, and carefully organized to maximize student learning:

- **Review Exercises** begin the section-level exercises and ensure that students have the prerequisite skills to complete the homework sets successfully.
- **Concept Connections** exercises prompt students to review the vocabulary and key concepts presented in the section.
- The core exercises are presented next and are grouped by objective. These exercises are linked to examples in the text and direct students to similar problems whose solutions have been stepped-out in detail.
- **Mixed Exercises** do *not* refer to specific examples so that students can dip into their mathematical toolkit and decide on the best technique to use.
- **Write About It** exercises are designed to emphasize mathematical language by asking students to explain important concepts.
- **Technology Connections** exercises require the use of a graphing utility and are found at the end of exercise sets. They can be easily skipped for those who do not encourage the use of calculators.



SECTION 4.3 Practice Exercises

Review Exercises

For Exercises 1–2, write an equation for the inverse function.

For Exercises 3–6, fill in the blank to make a true statement.

Concept Connections

Mixed Exercises

For Exercises 85–92, find an equation for the inverse function.

For Exercises 93–110, solve the equation. Write the solution set with exact solutions. Also give approximate solutions to 4 decimal places if necessary.

Write About It

111. Explain the equivalence property of exponential expressions.

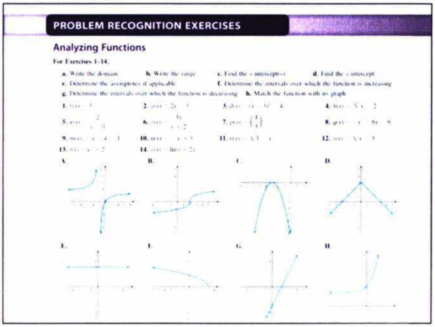
112. Explain the equivalence property of logarithmic expressions.

Expanding Your Skills

For Exercises 115–126, solve the equation.

Technology Connections

For Exercises 127–130, an equation is given in the form $Y_1(x) = Y_2(x)$. Graph Y_1 and Y_2 on a graphing utility on the window [-10, 10, 1] by [-10, 10, 1]. Then approximate the point(s) of intersection to approximate the solution(s) to the equation. Round to 4 decimal places.



PROBLEM RECOGNITION EXERCISES

Analyzing Functions

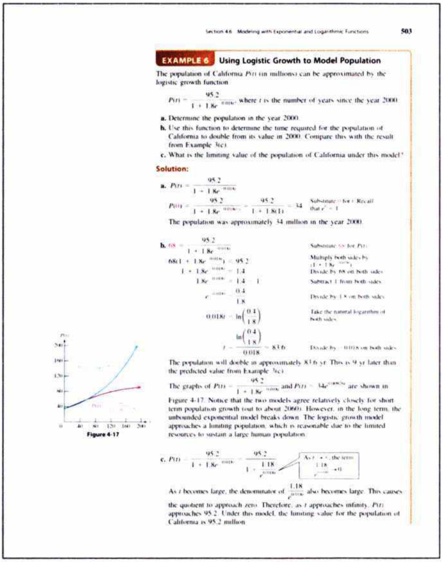
For Exercises 1–14,

Problem Recognition Exercises

Problem Recognition Exercises appear in strategic locations in each chapter of the text. These exercises help students compare and contrast a variety of problem types and determine which mathematical tool to apply to a given problem.

Examples

- The examples in the textbook are stepped-out in detail with thorough annotations at the right explaining each step.
- Following each example is a similar **Skill Practice** exercise to engage students by practicing what they have just learned.
- For the instructor, references to an even-numbered exercise are provided next to each example. These exercises are highlighted in the exercise sets and mirror the related examples. With increased demands on faculty time, this has been a popular feature to help faculty write their lectures and develop their presentation of material. If an instructor presents all of the highlighted exercises, then each objective of that section of text will be covered.



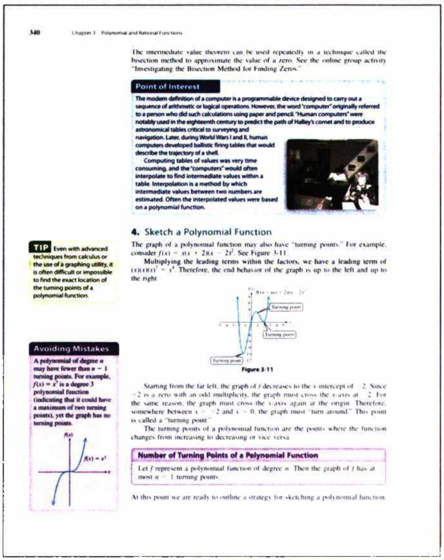
Modeling and Applications

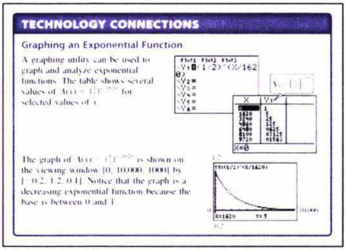
One of the most important tools to motivate our students is to make the mathematics they learn meaningful in their lives. The textbook is filled with robust applications and numerous opportunities for mathematical modeling for those instructors looking to incorporate these features into their course.

Callouts

Throughout the text, popular tools are included to highlight important ideas. These consist of

- **Tip** boxes that offer additional insight to a concept or procedure.
- **Avoiding Mistakes** boxes that fend off common mistakes.
- **Point of Interest** boxes that offer interesting and historical mathematical facts.
- **Instructor Notes** to assist with lecture preparation.





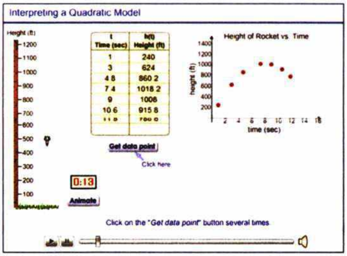
Graphing Calculator Coverage

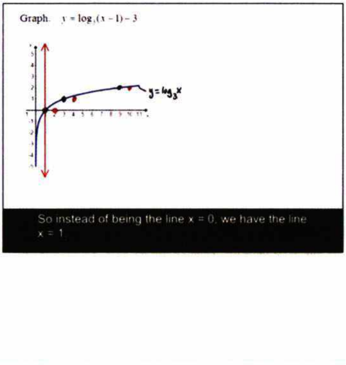
Material is presented throughout the book illustrating how a graphing utility can be used to view a concept in a graphical manner. The goal of the calculator material is not to replace algebraic analysis, but rather to enhance understanding with a visual approach. Graphing calculator examples are placed in self-contained boxes and may be skipped by instructors who choose not to implement the calculator. Similarly, the graphing calculator exercises are found at the end of the exercise sets and may also be easily skipped.

End-of-Chapter Materials

The textbook has the following end-of-chapter materials for students to review before test time.

- Brief summary with references to key concepts. A detailed summary is located at www.mhhe.com/millerca.
- Chapter review exercises.
- Chapter test.
- Cumulative review exercises. These exercises cover concepts in the current chapter as well as all preceding chapters.





Digital Media

Digital assets were created exclusively by the author team to ensure that the author voice is present and consistent throughout the supplement package.

- The **digital coauthor**, Donna Gerken, ensures that each algorithm in the online homework has a stepped-out solution unique to the Miller style.
- Julie Miller created **video content** (lecture videos, exercise videos, graphing calculator videos, and Excel videos) to give students access to classroom-type instruction by the author.
- Julie Miller constructed over 50 **dynamic math animations** to accompany the college algebra text. The animations are diverse in scope and give students an interactive approach to conceptual learning. The animated content illustrates difficult concepts by leveraging the use of on-screen movement where static images in the text may fall short. They are organized in Connect Math Hosted by ALEKS by chapter and section, as well as grouped by various categories including a Functions Library, Applications/Modeling, and Graphing.
- The authors developed lecture notes in both ready-made PDF format and in Word format so that instructors can tailor the material to their course.
- The authors created a library of activities in the Student Resource Manual that include group activities and Wolfram Alpha activities.