



SECOND EDITION

INTERMEDIATE ALGEBRA

K. ELAYN MARTIN-GAY

INTERMEDIATE ALGEBRA

S E C O N D E D I T I O N

K. ELAYN MARTIN-GAY

University of New Orleans



Prentice Hall

Upper Saddle River

New Jersey 07458

Library of Congress Cataloging-in-Publication Data

Martin-Gay, K. Elayn
Intermediate algebra / K. Elayn Martin-Gay.—2nd ed.
p. cm.
Includes index.
ISBN 0-13-242462-2
1. Algebra. I. Title.
QA152.2.M368 1996
512.9—dc20

96-35376
CIP

Sponsoring Editors, Melissa Acuña and Ann Marie Jones
Editor-in-Chief, Jerome Grant
Editorial Director, Tim Bozik
Production Editor, Barbara Mack
Managing Editor, Linda Behrens
Assistant Vice President of Production and Manufacturing, David W. Riccardi
Executive Managing Editor, Kathleen Schiaparelli
Development Editor, Karen Karlin
Editor-in-Chief of Development, Ray Mullaney
Marketing Manager, Jolene Howard
Creative Director, Paula Maylahn
Art Director, Amy Rosen
Assistant to Art Director, Rod Hernandez
Art Manager, Gus Vibal
Interior Design, Geri Davis, The Davis Group, Inc.
Cover Design, Bruce Kenselaar
Photo Editor, Lori Morris-Nantz
Photo Research, Rona Tuccillo
Manufacturing Buyer, Alan Fischer
Manufacturing Manager, Trudy Piscioti
Supplements Editor/Editorial Assistant, April Thrower
Cover Photo, Art Wolfe/Tony Stone Images



© 1997, 1993 by Prentice-Hall, Inc.
Simon & Schuster/ A Viacom Company
Upper Saddle River, New Jersey 07458

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Photo credits appear on page P-1, which constitutes a continuation of the copyright page.

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0 - 13 - 242462 - 2

Prentice-Hall International (UK) Limited, *London*
Prentice-Hall of Australia Pty. Limited, *Sydney*
Prentice-Hall Canada Inc., *Toronto*
Prentice-Hall Hispanoamericana, S.A., *Mexico City*
Prentice-Hall of India Private Limited, *New Delhi*
Prentice-Hall of Japan, Inc., *Tokyo*
Simon & Schuster Asia Pte. Ltd., *Singapore*
Editora Prentice-Hall do Brasil, Ltda., *Rio de Janeiro*

To my husband, Clayton,
and our sons,
Eric and Bryan

PREFACE

ABOUT THIS BOOK

This book was written to provide students with a solid foundation in algebra as well as to help develop their problem-solving skills. Specific care has been taken to prepare students to go on to their next course in mathematics and to help students succeed in nonmathematical courses that require a grasp of algebraic fundamentals. The basic concepts of graphs and functions are introduced early. These concepts, along with problem solving, data interpretation, and geometric concepts, are emphasized and integrated throughout the book.

The many factors that contributed to the success of the first edition have been retained. In preparing this edition, I considered the comments and suggestions of colleagues throughout the country and of the many users of the first edition. The American Mathematical Association of Two-Year Colleges (AMATYC) Crossroads in Mathematics: Standards for Introductory College Mathematics before Calculus and the NCTM Standards (plus Addenda), together with advances in technology, also influenced the careful reexamination of every section of the text. All of these inputs helped me update the presentation, enhancing the content and pedagogical value.


KEY PEDAGOGICAL FEATURES OF THE SECOND EDITION

Problem-Solving Process This is formally introduced in Chapter 2, with a new six-step process that is integrated throughout the text. The six steps are UNDERSTAND, ASSIGN, ILLUSTRATE (including diagrams appropriately labeled with variables), TRANSLATE, COMPLETE, and INTERPRET. The repeated use of these steps in a variety of examples shows their wide applicability. Reinforcing the steps can increase students' comfort level and confidence in tackling problems.

Exercise Sets The exercise sets are graded in difficulty and include computational, conceptual, and applied problems. The first few exercises in each set are carefully keyed to worked examples in the text. A student can quickly gain confidence and


then move on to the remaining exercises, which are not keyed to examples. Many exercises are new to the second edition. There are ample exercises throughout the book, including end-of-chapter reviews, tests, and cumulative reviews. In addition, each exercise set contains one or more of the following features.

Mental Math These problems are found at the beginning of an exercise set. They are mental warmups that reinforce concepts found in the accompanying section and increase students' confidence before they tackle an exercise set. By relying on their own mental skills, students increase not only their confidence in themselves, but also their number sense and estimation ability.


Conceptual and Writing Exercises These exercises, now found in almost every exercise set, are keyed with the icon . They call on students to demonstrate an understanding of a concept learned in the corresponding section. To do so, students are asked questions that require them to use two or more concepts together. Some exercises ask students to stop, think, and explain in their own words the concept(s) used in the exercises they have just completed. Guidelines recommended by AMATYC and other professional groups suggest that writing be incorporated into mathematics courses to reinforce concepts.

Data and Graphical Interpretation There is increased emphasis on data interpretation in exercises via tables and graphs. The ability to interpret data and read and create a variety of types of graphs is developed gradually so that students become comfortable with it.

Scientific Calculator Explorations and Exercises Scientific Calculator Explorations, although optional, contain examples and exercises to reinforce concepts or to motivate discovery learning. This feature is placed appropriately throughout the text to instruct students on the proper use of the calculator.

Additional exercises building on the skills developed in the Explorations may be found in exercise sets throughout the text and are marked with an icon . The inside back cover of the text includes a quick reference to selected keys on a scientific calculator.

Graphing Calculator Explorations and Exercises For graphing calculators or computer graphing utilities, these new Explorations are integrated appropriately throughout the text. They contain optional examples and exercises to reinforce concepts, to help interpret graphs, or to motivate discovery learning.

Additional new exercises building on the skills developed in the Explorations may be found in exercise sets throughout the text and are marked with an icon . The inside back cover of the text includes a quick reference to selected keys on a graphing calculator. In addition, a new appendix, "An Introduction to Using a Graphing Utility," has been added, along with exercises.

Review Exercises Formerly called Skill Review, these exercises are found at the end of each section after Chapter 1. These problems are keyed to earlier sections and review concepts that students learned earlier in the text and that are needed in the next section or in the next chapter. These exercises show the connections between earlier topics and later material.

A Look Ahead These are examples and problems similar to those found in a college algebra course. “A Look Ahead” is presented as a natural extension of the material and contains an example followed by advanced exercises. I suggest that any student who plans to take another algebra course work these problems.

Graphics The text contains numerous graphics, models, and illustrations to clarify visually and reinforce concepts and aid in problem solving. These include new bar charts, line graphs, calculator screens, application illustrations, and geometric figures. The text’s inside front cover includes a quick reference to geometric figures and formulas, and the inside back cover now includes a summary of common graphs.

Applications and Connections This book contains a wealth of practical applications in worked-out examples and exercise sets. The applications, located throughout the book, help to reinforce problem-solving skills and strengthen students’ understanding of mathematics in the real world. They show connections to a wide range of areas, such as biology, environmental issues, consumer applications, allied health, business, entertainment, history, art, literature, finance, sports, and music, as well as to related mathematical areas, such as geometry. Many involve interesting real-life data. Sources for data include newspapers, magazines, government publications, and reference books. Opportunities for obtaining your own real data are also included.

Group Activities Each chapter opens with a photograph and description of a real-life situation. At the close of the chapter, students can work cooperatively to apply the algebraic and critical-thinking skills they have learned to make decisions and answer the Group Activity that is related to the chapter-opening situation. These new Group Activities are multi-part, often hands-on, problems. These situations, designed for student involvement and interaction, allow for a variety of teaching and learning styles. Answers and tips for instructional strategies for Group Activities are available in the Annotated Instructor’s Edition. In addition, there are opportunities for group activities within section exercise sets.

Reminder Reminder boxes, formerly Helpful Hint boxes, contain practical advice on problem solving. Reminders appear in the context of material in the chapter and give students extra help in understanding and working problems. They are highlighted in a box for quick reference.

Chapter Highlights Found at the end of each chapter, the new Chapter Highlights contain key definitions, concepts, and examples to help students summarize and retain what they have learned.

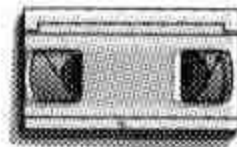

Chapter Review and Chapter Test The end of each chapter contains a review of topics introduced in the chapter. These review problems are keyed to sections. The chapter test is not keyed to sections.

Cumulative Review Each chapter after the first contains a Cumulative Review. Each Cumulative Review problem is actually an earlier worked example in the text that is referenced in the back of the book along with the answer. Students who

need to see a complete worked-out solution, with explanation, can do so by turning to the appropriate example in the text.

Readability and Connections Many reviewers of this edition as well as users of the previous edition have commented favorably on the readability and clear, organized presentation. I have tried to make the writing style as clear as possible while still retaining the mathematical integrity of the content. When a new topic is presented, I have attempted to relate the new ideas to those the students may already know. Constant reinforcement and connections within problem-solving strategies, data interpretation, geometry, patterns, graphs, and situations from everyday life can help students gradually master both new and old information.

Functional Use of Color and Design Elements of the text are highlighted with color and designed to make it easier for students to read and study.

Videotape and Software Icons At the beginning of each section, videotape  and software  icons are displayed. The icons help reinforce that these learning aids are available should students wish to use them in reviewing concepts and skills at their own pace. These items have direct correlation with the text and emphasize the text's methods of solution.

KEY CONTENT FEATURES OF THE SECOND EDITION

Overview In addition to the traditional topics in intermediate algebra courses, this text contains an early and intuitive introduction to graphs and functions and a strong emphasis on problem solving. Geometric concepts and reading and interpreting graphs and data are integrated throughout. The geometric concepts covered are those most important to a student's understanding of algebra, and I have included many applications and exercises devoted to this topic. Geometric figures and a review of angles, lines, and special triangles are covered in the appendices. Students are also given the opportunity to see how today's technology can help. Exercises are a critical part of student learning, and particular care was taken in writing these.

Increased Emphasis on Data Interpretation There is an increased emphasis on data interpretation via tables and graphs that begins in the first section of the book and continues throughout the text. The ability to interpret data and a variety of types of graphs, including bar, line, and circle graphs, is developed gradually so that students become comfortable with it.

Early and Intuitive Introduction to Graphs and Functions As bar and line graphs are gradually introduced in Chapters 1 and 2, an emphasis is slowly placed on the notion of paired data. This notion leads naturally to the concepts of ordered pairs, the rectangular coordinate system, and graphing equations introduced in Chapter 3.

Once students are comfortable with graphing equations, functions are introduced in Chapter 3. The concept of a function is illustrated in numerous ways to ensure student understanding: by listing ordered pairs of data, showing rectangular coordinate system graphs, visually representing set correspondences, and including numerous real-data examples. The importance of a function is continuously reinforced by not treating it as a single, stand-alone topic but by constantly integrating functions in appropriate sections of this text.

Increased Emphasis on Problem Solving Building on the strengths of the first edition, a special emphasis and strong commitment is given to contemporary and practical applications of algebra. The range of problem-solving techniques has also been expanded to include opportunities for using graphing utilities to help solve applications and for working with more real data.

Increased Opportunities to Use Technology As we noted, optional Scientific Calculator as well as Graphing Calculator Explorations are integrated appropriately throughout the text. A new appendix, “An Introduction to Using a Graphing Utility,” is included, along with exercises.

New Examples Additional detailed step-by-step examples were added where needed. Many of these reflect real-life situations. Examples are used in two ways—numbered, as formal examples, and unnumbered, to introduce a topic or informally discuss the topic.

New Exercises A significant amount of time was spent on the exercise sets. New exercises and additional examples help address a wide range of student learning styles and abilities. New kinds of exercises include group activities, conceptual and writing exercises, multi-part exercises, optional graphing calculator exercises, and data analysis from tables and graphs. In addition, the mental math, drill, and word problems were refined and enhanced.

SUPPLEMENTS FOR THE INSTRUCTOR

PRINTED SUPPLEMENTS

Annotated Instructor’s Edition (ISBN 0-13-258005-5)

- Answers to exercises on the same text page or in Instructor’s Answers section
- Instructor’s Answers section contains answers to exercises requiring graphical solutions
- Instructor’s Answers section also contains answers and pedagogical suggestions for group activities
- Notes to the Instructor

Instructor's Solutions Manual (ISBN 0-13-258047-0)

- Solutions to even-numbered exercises, Chapter Tests, and Cumulative Review exercises
- Graphics computer-generated for clarity
- Answers checked for accuracy

Test Item File (ISBN 0-13-258013-6)

- Six forms (A, B, C, D, E, and F) of Chapter Tests
 - three forms contain multiple-choice items
 - three forms contain free-response items
- Two forms of Cumulative Review Tests
 - every two chapters
- Final Exams
 - four forms with free-response scrambled items
 - four forms with multiple-choice scrambled items
- Answers to all items

MEDIA SUPPLEMENTS

TestPro3 Computerized Testing (Sample Disk IBM, ISBN 0-13-058104-3; Sample Disk Mac, ISBN 0-13-258112-4; IBM, ISBN 0-13-258021-7; Mac, ISBN 0-13-258039-X)

- Comprehensive text-specific testing
- Generates test questions and drill worksheets from algorithms keyed to the text learning objectives
- Edit or add your own questions
- Compatible with Scantron or other possible scanners

USING THE INTERNET AND A WEB BROWSER

Using the Internet and a Web browser, such as Netscape, can add to your mathematical resources. The following is a list of some of the sites that may be worth your or your students' visit.

- | | |
|---|---|
| • Prentice Hall Home Page | http://www.prenhall.com |
| • The Mathematical Association of America | http://www.maa.org |
| • The American Mathematical Society | http://www.ams.org |
| • The National Council of Teachers of Mathematics | http://www.nctm.org |
| • The Census Bureau | http://www.census.gov |
| • Texas Instruments | http://www.ti.com/calc |

INTERNET GUIDE

- This guide provides a brief history of the Internet, discusses the use of the World Wide Web, and describes how to find your way within the Internet and how

to reach others on it. Contact your local Prentice Hall representative for the Internet Guide.

SUPPLEMENTS FOR THE STUDENT

PRINTED SUPPLEMENTS

Student Solutions Manual (ISBN 0-13-258096-9)

- Detailed step-by-step solutions to odd-numbered text and review exercises
- Solutions to all chapter practice tests and Cumulative Review exercises
- Solution methods reflect those emphasized in the text.
- Includes study skills and note-taking suggestions
- Ask your bookstore about ordering.

Study Guide (ISBN 0-13-258088-8)

- Additional step-by-step worked-out examples and exercises
- Practice tests and final examinations
- Solution methods reflect those emphasized in the text.
- Includes study skills and note-taking suggestions
- Ask your bookstore about ordering.

The New York Times Supplement

- A free newspaper from Prentice Hall and *The New York Times*
- Interesting and current articles on mathematics
- Invites discussion and writing about mathematics
- Created new each year

How to Study Math (ISBN 0-13-020884-1)

MEDIA SUPPLEMENTS

Videotape Series (Sample Video, ISBN 0-13-258146-9; Video Series, ISBN 0-13-258070-5)

- Specifically keyed to the text by section
- Presentation and step-by-step examples by K. Elayn Martin-Gay
- Comprehensive coverage

MathPro Tutorial Software

(IBM Network-User, ISBN 0-13-258054-3;
IBM Single-User, ISBN 0-13-268814-X;
Mac Network-User, ISBN 0-13-258062-4;
Mac Single-User, ISBN 0-13-281552-4)

- Text-specific tutorial exercises
- Interactive feedback
- Unlimited practice Warm-up Exercises
- Graded and recorded Practice Problems
- New user interface, glossary, and expressions editor for ease of use and flexibility

ACKNOWLEDGMENTS

First, as usual, I would like to thank my husband, Clayton, for his constant encouragement. I would also like to thank my children, Eric and Bryan, for continuing to eat my burnt bacon and cookies even though they now realize that they are “extra crispy.”

I would also like to thank my extended family for their invaluable help and wonderful sense of humor. Their contributions are too numerous to list. They are Peter, Karen, Michael, Christopher, Matthew, and Jessica Callac; Stuart, Earline, Melissa, and Mandy Martin; Mark, Sabrina, and Madison Martin; Leo and Barbara Miller; and Jewett Gay.

A special thank you to all the users of the first edition of this text who made suggestions for improvements that were incorporated into the second edition. I would also like to thank the following reviewers of this text:

Carol Bernath *Tallahassee Community College*
 Larry Blevins, *Tyler Junior College*
 Douglas Cameron, *University of Akron*
 Dennis Carrie, *Golden West College*
 Camille Cochrane, *Shelton State Community College*
 Linda F. Crabtree, *Longview Community College*
 Gregory Davis, *University of Wisconsin–Green Bay*
 Irene Doo, *Austin Community College*
 James V. Frugale, *Middlesex Community–Technical College*
 D. Michael Hamm, *Brookhaven College*
 Doug Jones, *Tallahassee Community College*
 Rosemary M. Karr, *Collin County Community College*
 Harvey Lambert, *University of Nevada–Reno*
 Peter A. Lindstrom, *North Lake College*
 Marilyn Massey-Moss, *Collin County Community College*
 Sofya Nayer, *Borough of Manhattan Community College*
 Frank Rivera, *Glendale Community College*
 Patty Sheeran Schug, *McHenry County College*
 Linda Schultz, *McHenry County College*
 Arthur E. Schwartz, *Mercer County Community College*

Laurence Small, *L.A. Pierce College*
John Squires, *Cleveland St. Community College*
Sharon Taylor-Riley, *Wayne County Community College*
Sally Vestal, *Southwest Missouri State University*
Najib Yazbak, *Wayne County Community College*

Cheryl Roberts, James Sellers, and Phyllis Barnidge did an excellent job of providing answers and solutions, and contributing to the overall accuracy of the book. Karen Karlin was invaluable for her many suggestions during the development of the second edition. I very much appreciated the writers and accuracy checkers of the supplements to accompany this text as well as Emily Keaton's contributions. Last, but by no means least, a special thanks to the staff at Prentice Hall for their support and assistance: Melissa Acuña, Ann Marie Jones, Barbara Mack, Linda Behrens, Alan Fischer, Amy Rosen, Gus Vibal, Paula Maylahn, April Thrower, Evan Girard, Jolene Howard, Gary June, Jerome Grant, and Tim Bozik.

K. Elayn Martin-Gay

ABOUT THE AUTHOR

K. Elayn Martin-Gay has taught mathematics at the University of New Orleans for over 16 years. She has received numerous teaching awards, including the local University Alumni Association's Award for Excellence in Teaching.

Over the years, Elayn has developed a videotaped lecture series to help her students better understand algebra. This highly successful video material is the basis of the four-book series *Prealgebra*, *Beginning Algebra*, *Intermediate Algebra*, and *Introductory and Intermediate Algebra*, a combined approach.

HOW TO USE THE TEXT: A GUIDE FOR STUDENTS

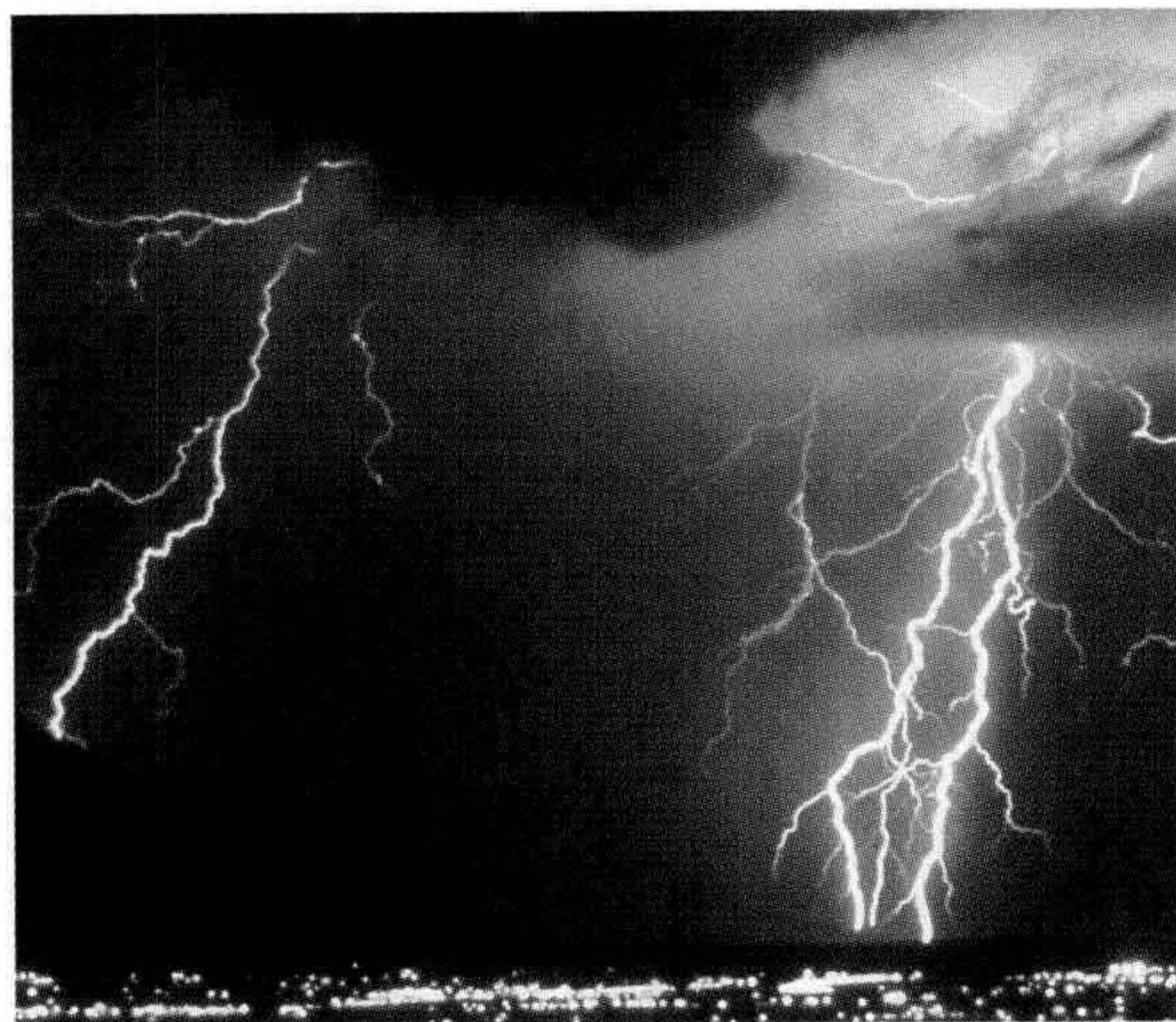
Intermediate Algebra, Second Edition, has been designed as one of several tools in a fully integrated learning package to help you develop intermediate algebra skills. Our goal is to encourage your success and mastery of the mathematical concepts introduced in this text. Take a few moments to see how this text will help you excel.

CHAPTER

4

- 4.1 SOLVING SYSTEMS OF LINEAR EQUATIONS IN TWO VARIABLES
- 4.2 SOLVING SYSTEMS OF LINEAR EQUATIONS IN THREE VARIABLES
- 4.3 SYSTEMS OF LINEAR EQUATIONS AND PROBLEM SOLVING
- 4.4 SOLVING SYSTEMS OF EQUATIONS BY MATRICES
- 4.5 SOLVING SYSTEMS OF EQUATIONS BY DETERMINANTS

SYSTEMS OF EQUATIONS

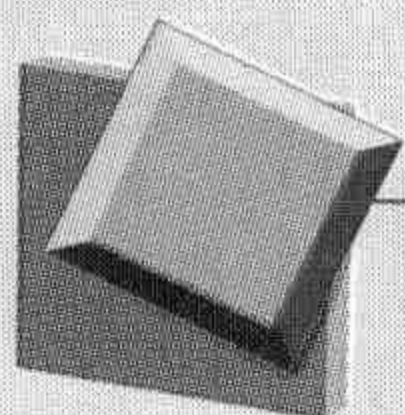


LOCATING LIGHTNING STRIKES

Lightning, most often produced during thunderstorms, is a rapid discharge of high-current electricity into the atmosphere. Around the world, lightning occurs at a rate of approximately 100 flashes per second. Because of lightning's potentially destructive nature, meteorologists track lightning activity by recording and plotting the positions of lightning strikes.

IN THE CHAPTER GROUP ACTIVITY ON PAGE 229, YOU WILL HAVE THE OPPORTUNITY TO PINPOINT THE LOCATION OF A LIGHTNING STRIKE.

The photo application at the opening of every chapter and **applications throughout** offer real-world scenarios that connect mathematics to your life. In addition, at the end of the chapter, a group activity or discovery-based project further shows the chapter's applicability.



APPLY THE PROBLEM-SOLVING PROCESS

As you study, **make connections**—this text’s organization can help you. There are features in this text designed to help you relate material you are learning to previously mastered material. Math topics are tied to real life as often as possible. Key learning objectives are introduced and easily identified in every section.

Save time by having a plan. Follow this **six-step process**, and you will find yourself successfully solving a wide range of problems.

PROBLEM-SOLVING STEPS

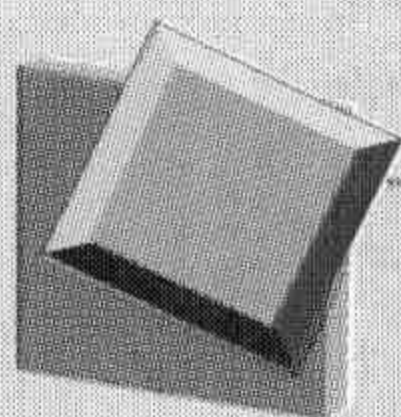
1. **UNDERSTAND** the problem. During this step, don’t work with variables, but simply become comfortable with the problem. Some ways of accomplishing this are listed next.
 - Read and reread the problem.
 - Construct a drawing to help visualize the problem.
 - Propose a solution and check. Pay careful attention as to how you check your proposed solution. This will help later when you write an equation to model the problem.
2. **ASSIGN** a variable to an unknown in the problem. Use this variable to represent any other unknown quantities.
3. **ILLUSTRATE** the problem. A diagram or chart *using the assigned variables* can often help us visualize the known facts.
4. **TRANSLATE** the problem into a mathematical model. This is often an equation.
5. **COMPLETE** the work. This often means to solve the equation.
6. **INTERPRET** the results. *Check* the proposed solution in the stated problem and *state* your conclusion.

Page 52

RE M I N D E R Note that $f(x)$ is a special symbol in mathematics used to denote a function. The symbol $f(x)$ is read “ f of x .” It does **not** mean $f \cdot x$ (f times x).

Page 128

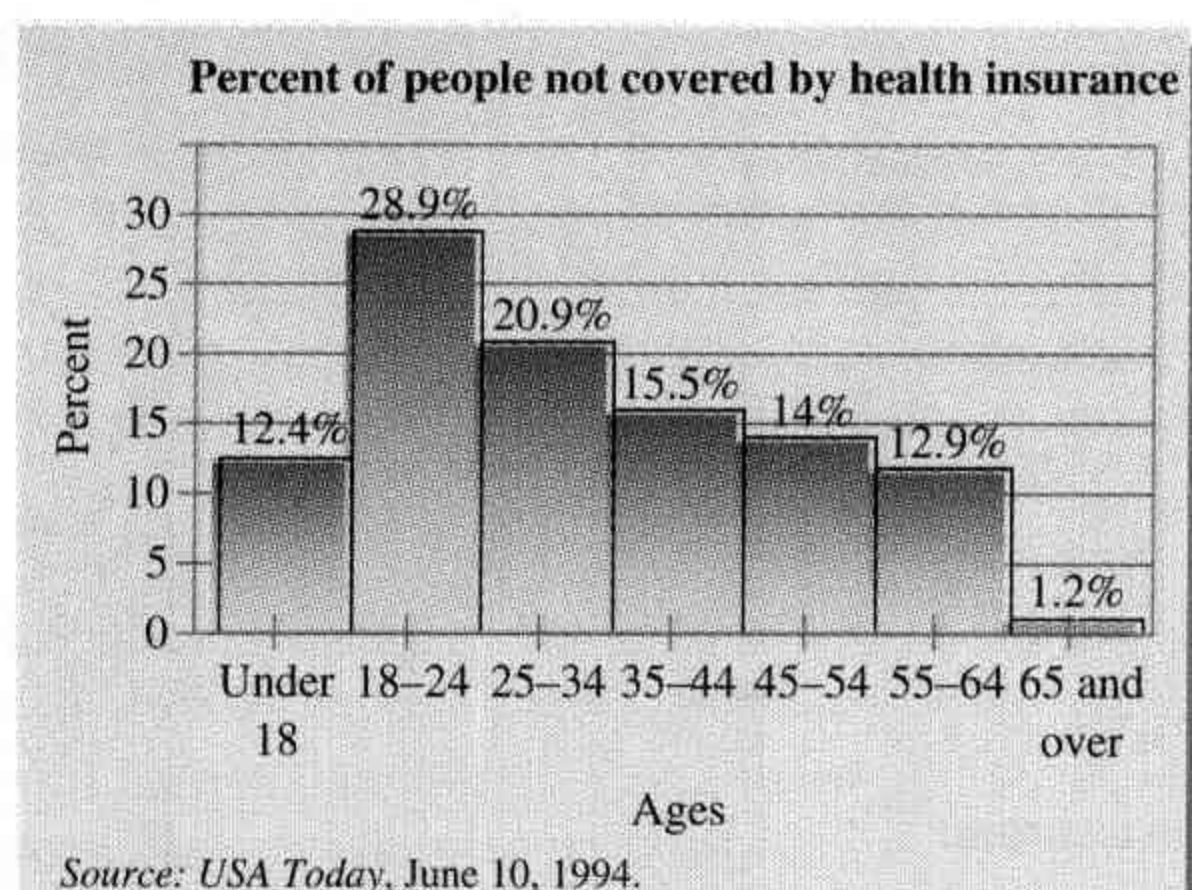
“**Reminders**” contain practical advice and assist you in understanding and working problems.



VISUALIZE . . . SEE THE CONCEPTS!

Graphing is introduced early and intuitively. Fully integrated in all appropriate sections with an increased emphasis on **data interpretation** via tables and graphs, this concept is developed gradually throughout the text. Knowing how to use data and graphs is a valuable skill in the workplace as well as in other courses.

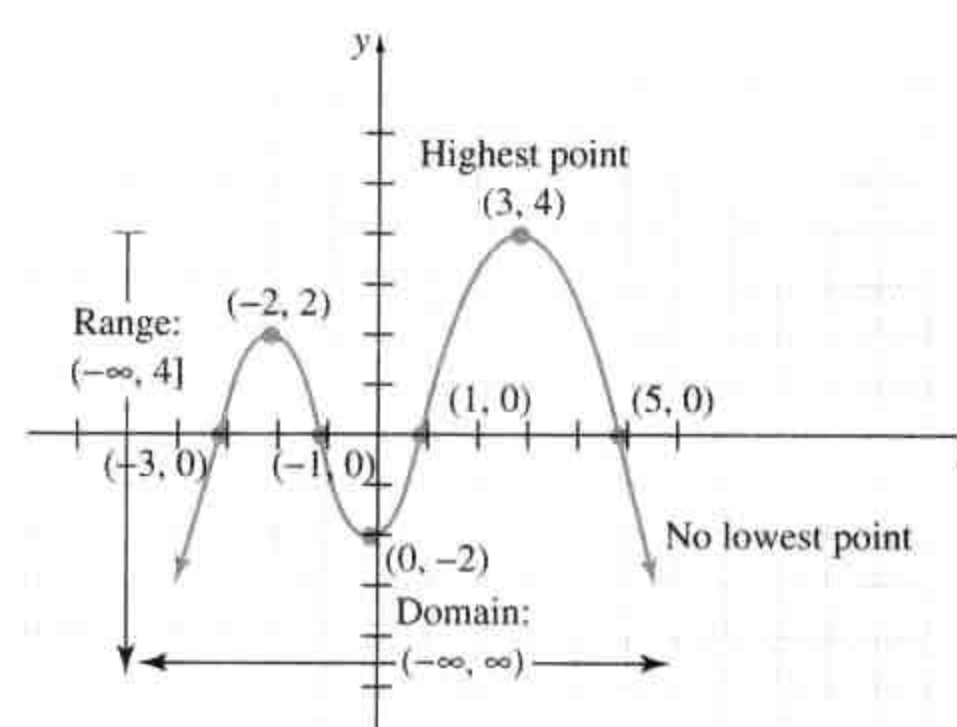
87. What percent of people aged 18 to 34 have no health insurance?



Page 341

Real Data are integrated throughout the text, drawn from familiar sources such as magazines and newspapers.

AN INTRODUCTION TO GRAPHING POLYNOMIAL FUNCTIONS SECTION 5.9 311



f. The y-values are greater than 0 when the graph lies above the x-axis. The x-values when this occurs are between $x = -3$ and $x = -1$ and between $x = 1$ and $x = 5$.

Page 311

Many graphics, models and illustrations provide **visual reinforcement** of concepts.



GRAPHING CALCULATOR EXPLORATIONS

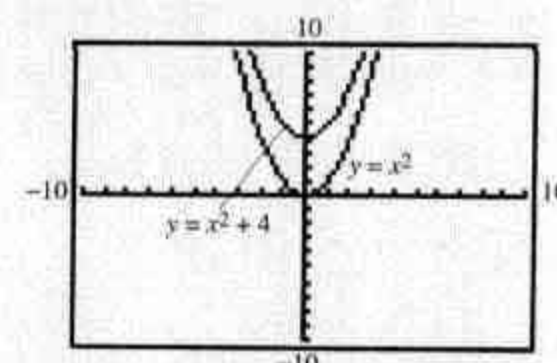
It is possible to use a grapher to sketch the graph of more than one equation on the same set of axes. This feature can be used to confirm a pattern suggested in Section 3.1. For example, graph the functions $f(x) = x^2$ and $g(x) = x^2 + 4$ on the same set of axes.

To graph on the same set of axes, press the $\boxed{Y=}$ key and enter the equations on the first two lines.

$$Y_1 = x^2$$

$$Y_2 = x^2 + 4$$

Then press the $\boxed{\text{GRAPH}}$ key as usual. The screen should look like this:



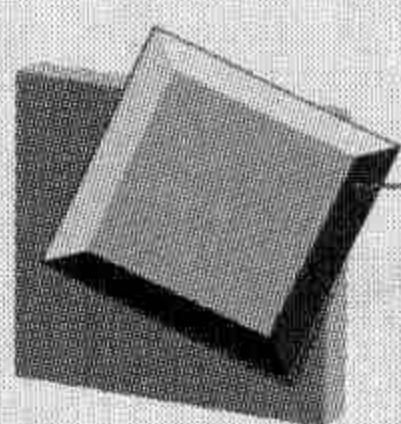
Notice that the graph of y or $g(x) = x^2 + 4$ is the graph of $y = x^2$ moved 4 units upward.

Graph each pair of functions on the same set of axes. Describe the similarities and differences in their graphs.

- | | |
|-------------------|------------------|
| 1. $f(x) = x $ | 2. $f(x) = x^2$ |
| $g(x) = x + 1$ | $h(x) = x^2 - 5$ |
| 3. $f(x) = x$ | 4. $f(x) = x $ |
| $H(x) = x - 6$ | $G(x) = x + 3$ |
| 5. $f(x) = -x^2$ | 6. $f(x) = x$ |
| $F(x) = -x^2 + 7$ | $F(x) = x + 2$ |

Page 131

Scientific and Graphing Calculator Explorations and exercises are woven into the appropriate sections to reinforce concepts and **motivate discovery-based learning**.



CHECK YOUR UNDERSTANDING. EXPAND IT. EXPLORE!

Good exercise sets are essential to the make-up of a solid intermediate algebra textbook. The exercises in this textbook are designed to help you understand skills and concepts as well as challenge and motivate you. Note, too, the Highlights, Test, Review, and Cumulative Review found at the end of each chapter.

MENTAL MATH

Use positive exponents to state each expression.

1. $5x^{-1}y^{-2}$
2. $7xy^{-4}$
3. $a^2b^{-1}c^{-5}$
4. $a^{-4}b^2c^{-6}$
5. $\frac{y^{-2}}{x^{-4}}$
6. $\frac{x^{-7}}{z^{-3}}$

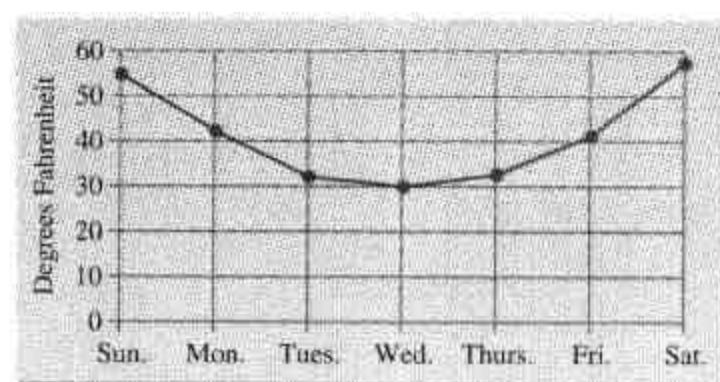
Confidence-building
Mental Math problems
are in many sections.

Page 249

A Look Ahead examples and problems are similar to those found in the *next* algebra course and include more advanced exercises.

Conceptual and Writing Exercises bring together two or more concepts and often require “in your own words” written explanation.

The accompanying graph shows the daily low temperatures for one week in New Orleans, Louisiana.



67. Which day of the week shows the greatest decrease in temperature low?
68. Which day of the week shows the greatest increase in temperature low?
69. Which day of the week had the lowest temperature?
70. Use the graph to estimate the low temperature on Thursday.

Notice that the shape of the temperature graph is similar to a parabola (see Section 5.9). In fact, this graph can be modeled by the quadratic function $f(x) = 3x^2 - 18x + 57$, where $f(x)$ is the temperature in degrees Fahrenheit and x is the number of days from Sunday. Use this function to answer Exercises 71 and 72.

71. Use the quadratic function given to approximate the temperature on Thursday. Does your answer agree with the graph above?
72. Use the function given and the quadratic formula to find when the temperature was 35°F. [Hint: Let $f(x) = 35$ and solve for x .] Round your answer to one decimal place and interpret your result. Does your answer agree with the graph above?
73. Use a grapher to solve Exercises 61 and 63.
74. Use a grapher to solve Exercises 62 and 64.

Review Exercises

Solve each equation. See Sections 6.7 and 7.6.

75. $\sqrt{5x-2} = 3$
76. $\sqrt{y+2} + 7 = 12$
77. $\frac{1}{x} + \frac{2}{5} = \frac{7}{x}$
78. $\frac{10}{z} = \frac{5}{z} - \frac{1}{3}$

Factor. See Section 5.7.

79. $x^4 + x^2 - 20$
80. $2y^4 + 11y^2 - 6$
81. $z^4 - 13z^2 + 36$
82. $x^4 - 1$

A Look Ahead

EXAMPLE

Solve $x^2 - 3\sqrt{2}x + 2 = 0$.

Solution:

In this equation, $a = 1$, $b = -3\sqrt{2}$, and $c = 2$. By the quadratic formula, we have

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{3\sqrt{2} \pm \sqrt{(-3\sqrt{2})^2 - 4(1)(2)}}{2(1)} \\ &= \frac{3\sqrt{2} \pm \sqrt{18 - 8}}{2} = \frac{3\sqrt{2} \pm \sqrt{10}}{2} \end{aligned}$$

The solution set is $\left\{ \frac{3\sqrt{2} + \sqrt{10}}{2}, \frac{3\sqrt{2} - \sqrt{10}}{2} \right\}$.

Use the quadratic formula to solve each quadratic equation. See the preceding example.

83. $3x^2 - \sqrt{12}x + 1 = 0$
84. $5x^2 + \sqrt{20}x + 1 = 0$
85. $x^2 + \sqrt{2}x + 1 = 0$
86. $x^2 - \sqrt{2}x + 1 = 0$
87. $2x^2 - \sqrt{3}x - 1 = 0$
88. $7x^2 + \sqrt{7}x - 2 = 0$

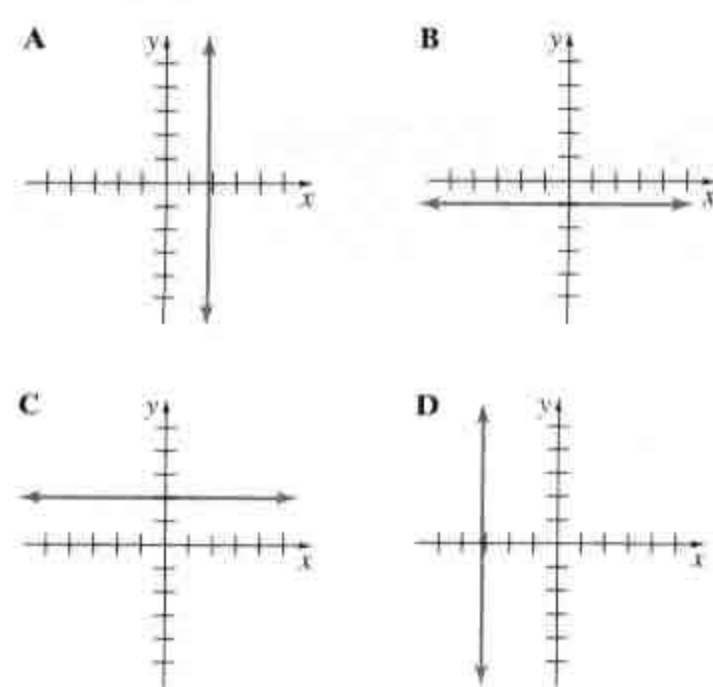
Page 487

21. In your own words, explain how to find x - and y -intercepts.
22. Explain why it is a good idea to use three points to graph a linear equation.

Graph each linear equation. See Examples 6 and 7.

23. $x = -1$
24. $y = 5$
25. $y = 0$
26. $x = 0$
27. $y + 7 = 0$
28. $x - 3 = 0$

Match each equation with its graph.



29. $y = 2$
30. $x = -3$
31. $x - 2 = 0$
32. $y + 1 = 0$

33. Discuss whether a vertical line ever has a y -intercept.
34. Discuss whether a horizontal line ever has an x -intercept.

Build your confidence with the beginning exercises; the first part of each exercise set is keyed to already worked examples. Then try the remaining exercises.

Page 143