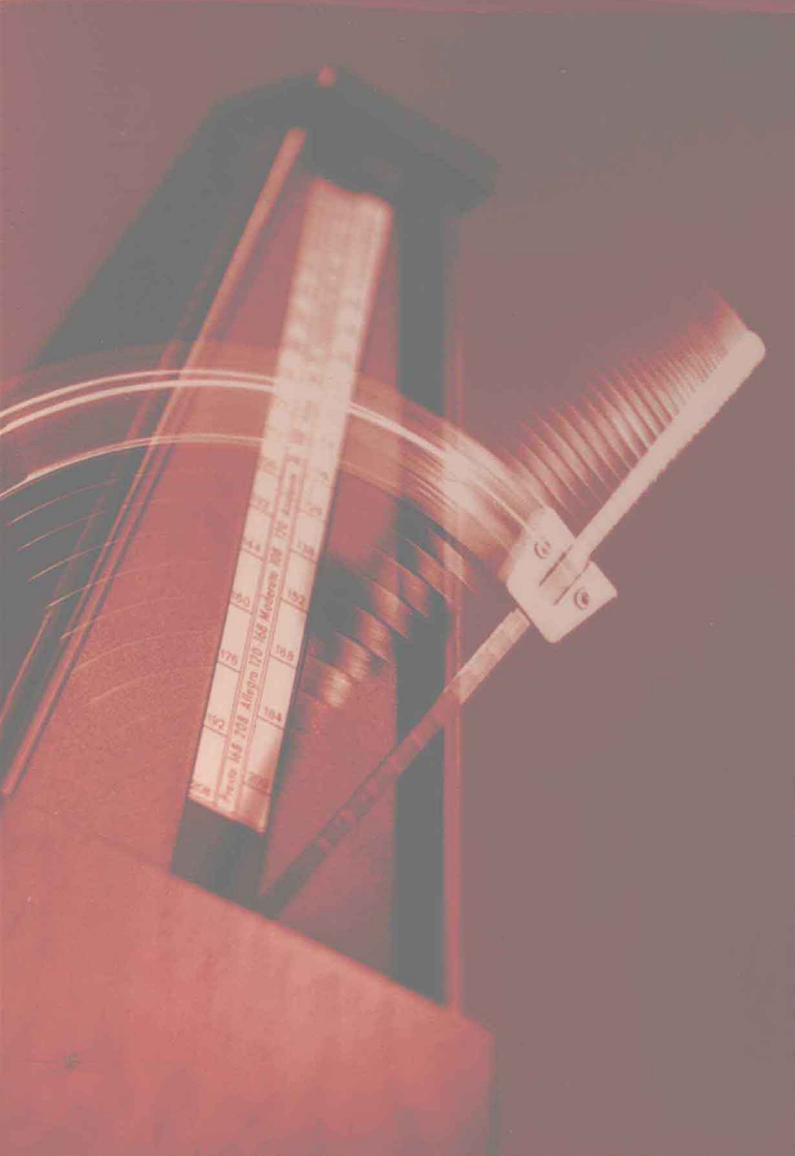


# INTERMEDIATE ALGEBRA

EIGHTH EDITION



MARVIN L. BITTINGER

# Intermediate Algebra

Eighth Edition

**Marvin L. Bittinger**

Indiana University—Purdue University  
at Indianapolis



**ADDISON-WESLEY**

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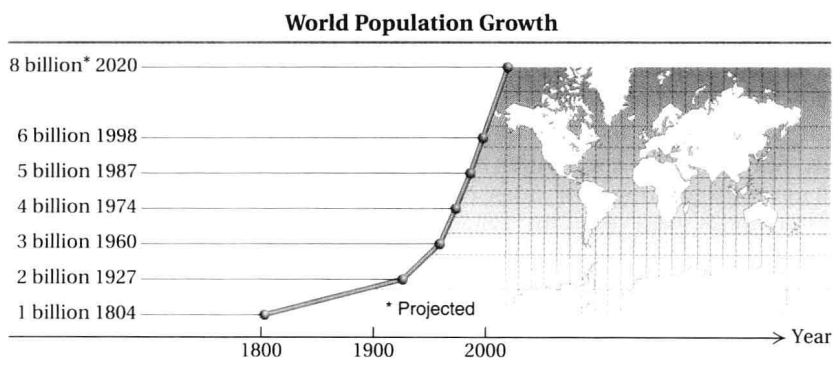
# Preface

This text is in a series of texts that includes the following:

- Bittinger: *Basic Mathematics*, Eighth Edition
- Bittinger: *Fundamental Mathematics*, Second Edition
- Bittinger: *Introductory Algebra*, Eighth Edition
- Bittinger: *Intermediate Algebra*, Eighth Edition
- Bittinger: *Intermediate Algebra*, Eighth Edition (Alternate Version)
- Bittinger/Beecher: *Introductory and Intermediate Algebra: A Combined Approach*

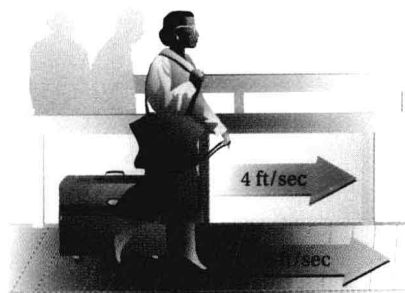
*Intermediate Algebra*, Eighth Edition, is a significant revision of the Seventh Edition, particularly with respect to design, art program, pedagogy, features, and supplements package. Its unique approach, which has been developed and refined over eight editions, continues to blend the following elements in order to bring students success:

- **Writing style.** The author writes in a clear easy-to-read style that helps students progress from concepts through examples and margin exercises to section exercises.
- **Problem-solving approach.** The basis for solving problems and real-data applications is a five-step process (*Familiarize, Translate, Solve, Check, and State*) introduced early in the text and used consistently throughout. This problem-solving approach provides students with a consistent framework for solving applications. (See pages 91, 97, 255, and 360.)
- **Real data.** Real-data applications aid in motivating students by connecting the mathematics to their everyday lives. Extensive research was conducted to find new applications that relate mathematics to the real world.

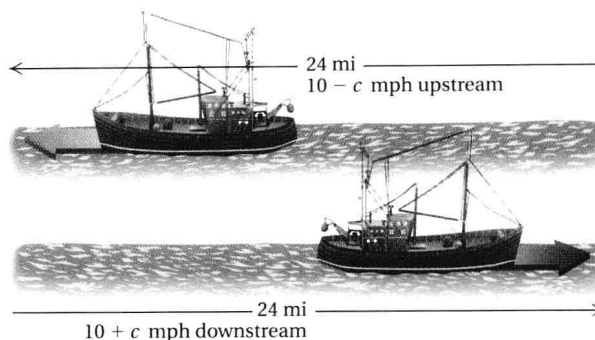


Source: U.S. Bureau of the Census





- **Art program.** The art program has been expanded to improve the visualization of mathematical concepts and to enhance the real-data applications.



- **Reviewer feedback.** The author solicits feedback from reviewers and students to help fulfill student and instructor needs.
- **Accuracy.** The manuscript is subjected to an extensive accuracy-checking process to eliminate errors.
- **Supplements package.** All ancillary materials are closely tied with the text and created by members of the author team to provide a complete and consistent package for both students and instructors.

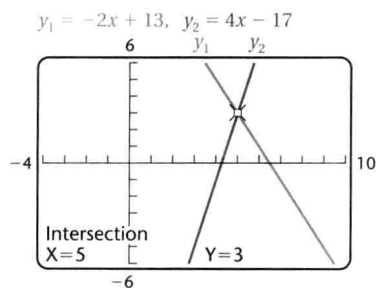
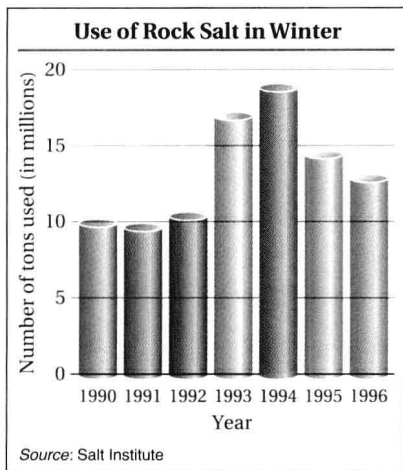
## What's New in the Eighth Edition?

The style, format, and approach of the Seventh Edition have been strengthened in this new edition in a number of ways.

**Updated Applications** Extensive research has been done to make the applications in the Eighth Edition even more up to date and realistic. A large number of the applications are new to this edition, and many are drawn from the fields of business and economics, life and physical sciences, social sciences, and areas of general interest such as sports and daily life. To encourage students to understand the relevance of mathematics, many applications are enhanced by graphs and drawings similar to those found in today's newspapers and magazines. Many applications are also titled for quick and easy reference, and most real-data applications are credited with a source line. (See pages 209, 216, 310, 580, and 666.)


**Improving Your Math Study Skills** Occurring at least once in every chapter, and referenced in the table of contents, these mini-lessons provide students with concrete techniques to improve studying and test-taking. These features can be covered in their entirety at the beginning of the course, encouraging good study habits early on, or they can be used as they occur in the text, allowing students to learn them gradually. These features can also be used in conjunction with Marvin L. Bittinger's "Math Study Skills" Videotape, which is free to adopters. Please contact your Addison Wesley Longman sales consultant for details on how to obtain this videotape. (See pages 10, 128, 416, and 670.)


**Calculator Spotlights** Designed specifically for the beginning algebra student, these optional features include graphing-calculator instruction and practice exercises (see pages 182, 234, 305, and 458). Answers to all Calculator Spotlight exercises appear at the back of the text.






**New Art and Design** To enhance the greater emphasis on real data and applications, we have extensively increased the number of pieces of technical and situational art (see pages 101, 149, 218, and 605). Students gain a visual understanding of the algebra when they see a graphical interpretation of the algebraic solution. For this reason, numerous graphs have been added in the examples and exercises. The use of color has been carried out in a methodical and precise manner so that its use carries a consistent meaning, which enhances the readability of the text. For example, the use of both red and blue in mathematical art increases understanding of the concepts. When two lines are graphed using the same set of axes, one is usually red and the other blue. Note that equation labels are the same color as the corresponding line to aid in understanding. Answer lines have also been deleted from all section exercise sets to allow room for more exercises and additional art to better illustrate the exercises.

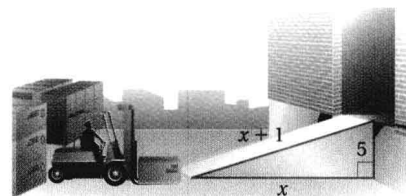
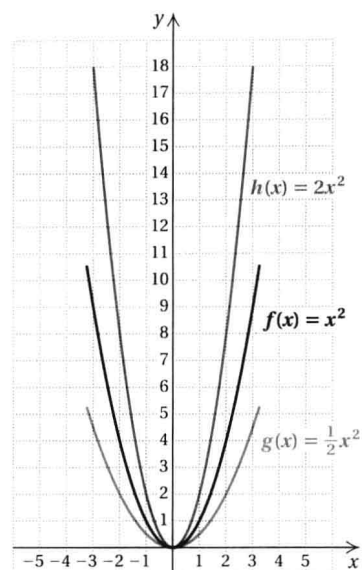
**World Wide Web Integration**  The World Wide Web is a powerful resource available to more and more people every day. In an effort to get students more involved in using this source of information, we have added a World Wide Web address ([www.mathmax.com](http://www.mathmax.com)) to every chapter opener (see pages 147, 299, and 603). Students can go to this page on the World Wide Web to further explore the subject matter of the chapter-opening application. Selected exercise sets, marked on the first page of the exercise set with an icon (see pages 199, 393, and 541), have additional practice-problem worksheets that can be downloaded from this site. Additional, more extensive, Summary and Review pages for each chapter, as well as other supplementary material, can also be downloaded for instructor and student use.

**Algebraic–Graphical Connections**  To give students a better visual understanding of algebra, we have included algebraic–graphical connections in the Eighth Edition (see pages 415, 491, and 523). This feature gives the algebra more meaning by connecting the algebra to a graphical interpretation.

**Collaborative Learning Features** An icon  located at the end of an exercise set signals the existence of a Collaborative Learning Activity correlating to that section in Irene Doo's *Collaborative Learning Activities Manual* (see pages 106, 202, 312, and 462). Please contact your Addison Wesley Longman sales consultant for details on ordering this supplement.

**Exercises** The deletion of answer lines in the exercise sets has allowed us to include more exercises in the Eighth Edition. Exercises are paired, meaning that each even-numbered exercise is very much like the odd-numbered one that precedes it. This gives the instructor several options: If an instructor wants the student to have answers available, the odd-numbered exercises are assigned; if an instructor wants the student to practice (perhaps for a test), with no answers available, then the even-numbered exercises are assigned. In this way, each exercise set actually serves as two exercise sets. Answers to all odd-numbered exercises, with the exception of the Thinking and Writing exercises, and *all* Skill Maintenance exercises are provided at the back of the text. If an instructor wants the student to have access to all the answers, a complete answer book is available.

**Skill Maintenance Exercises** The Skill Maintenance exercises have been enhanced by the inclusion of 60% more exercises in this edition (see pages 82, 332, and 444). These exercises focus on the four Objectives for



Retesting listed at the beginning of each chapter, but they also review concepts from other sections of the text in order to prepare students for the Final Examination. Section and objective codes appear next to each Skill Maintenance exercise for easy reference. Answers to all Skill Maintenance exercises appear at the back of the book.

**Synthesis Exercises** These exercises now appear in every exercise set, Summary and Review, Chapter Test, and Cumulative Review. Synthesis exercises help build critical thinking skills by requiring students to synthesize or combine learning objectives from the section being studied as well as preceding sections in the book. In addition, the Critical Thinking feature from the Seventh Edition has been incorporated into the Synthesis exercises for the Eighth Edition (see pages 164, 286, and 504).

**Thinking and Writing Exercises** ♦ Two Thinking and Writing exercises (denoted by the maze icon) have been added to the Synthesis section of every exercise set and Summary and Review. Designed to develop comprehension of critical concepts, these exercises encourage students to both think and write about key mathematical ideas in the chapter (see pages 38, 476, and 576).

**Content** We have made the following improvements to the content of *Intermediate Algebra*.

Through thorough research and an extensive review process, *Intermediate Algebra*, Eighth Edition, has experienced major changes in the development and reorganization of the table of contents. The following list includes only twelve of those changes. For a complete conversion guide, contact your Addison Wesley Longman sales representative.

- Review topics, formerly located in Chapter 1, have been streamlined and reorganized into a two-part review in Chapter R: real-number computation review in Sections R.1–R.3 and algebraic manipulation review in Sections R.4–R.7. This provides the instructor with flexible options when choosing the amount of review to include in this course.
- Section 1.4 (“Sets, Interval Notation, and Inequalities”) has been expanded with the introduction of interval notation. Where appropriate, solution sets are now given in both set-builder notation and interval notation. Interval notation enhances the preparation for later courses.
- To provide a solid background for college algebra, functions are introduced early in the Eighth Edition (Section 2.2, “Functions and Graphs,” and Section 2.3, “Finding Domain and Range”) and are then integrated throughout. This early function approach allows for many uses of functions such as expansion of graphing applications in the polynomial, rational, radical, quadratic, exponential, and logarithmic topics.
- Modeling data with functions is now presented in three new sections: Section 2.7 (“Mathematical Modeling with Linear Functions”), Section 7.7 (“Mathematical Modeling with Quadratic Functions”), and Section 8.7 (“Mathematical Modeling with Exponential and Logarithmic Functions”). The study of applications becomes more interactive when students learn to model real data with functions and make predictions from graphs.
- Section 3.7 (“Business and Economics Applications”) has been added to broaden the base of function applications. This section provides the background for business students who plan to take Business Calculus and Finite Mathematics.
- Objective 4.2e is new to Section 4.2 (“Multiplication of Polynomials”). Here students prepare for later courses by simplifying notation like  $f(a + h)$  and  $f(a + h) - f(a)$ .

- Section 5.4 (“Complex Rational Expressions”), formerly located near the end of the chapter on rational expressions, is now placed earlier in this chapter, separating the rational expressions (Sections 5.1–5.4) and the rational equations (Sections 5.5–5.8).
- The early placement of rational numbers as exponents in Section 6.2 (“Rational Numbers as Exponents”) allows for greater inclusion of rational exponents throughout the chapter. This especially smoothes the explanation of simplifying and calculating with rational exponents in Sections 6.3–6.5.
- The coverage of quadratic applications has been expanded with Section 7.3 (“Applications Involving Quadratic Equations”), which is now placed immediately after the introduction of the quadratic formula, and with Section 7.7 (“Mathematical Modeling with Quadratic Functions”).
- Chapter 8 (*Exponential and Logarithmic Functions*) immediately follows the chapter on quadratics. Early presentation of function topics has allowed a smoother transition between types of functions throughout the text. Section 8.2 (“Inverse and Composite Functions”) is now included immediately before the section in which it is needed (Section 8.3, “Logarithmic Functions”).
- Placing the chapter on conic sections at the end of the text provides flexibility for those who consider this material optional at the intermediate level. The section on ellipses and hyperbolas in the Seventh Edition is now expanded into two sections: Section 9.2 (“Conic Sections: Ellipses”) and Section 9.3 (“Conic Sections: Hyperbolas”).
- Four new appendixes (*Handling Dimension Symbols*, *Determinants and Cramer’s Rule*, *Elimination Using Matrices*, and *The Algebra of Functions*) have been added to the Eighth Edition. As reviewers have requested, these topics are now placed in a more optional format.

## Learning Aids

**Interactive Worktext Approach** The pedagogy of this text is designed to provide an interactive learning experience between the student and the exposition, annotated examples, art, margin exercises, and exercise sets. This approach provides students with a clear set of learning objectives, involves them with the development of the material, and provides immediate and continual reinforcement and assessment.

*Section objectives* are keyed by letter not only to section subheadings, but also to exercises in the exercise sets and Summary and Review, as well as answers to the Pretest, Chapter Test, and Cumulative Review questions. This enables students to easily find appropriate review material if they are unable to work a particular exercise.

Throughout the text, students are directed to numerous *margin exercises*, which provide immediate reinforcement of the concepts covered in each section.

**Review Material** The Eighth Edition of *Intermediate Algebra* continues to provide many opportunities for students to prepare for final assessment.

Now in a two-column format, the *Summary and Review* appears at the end of each chapter and provides an extensive set of review exercises. Reference codes beside each exercise or direction line preceding it allow the student to easily return to the objective being reviewed (see pages 143, 515, and 675).



Also included at the end of every chapter but Chapters R and 1 is a *Cumulative Review*, which reviews material from all preceding chapters. At the back of the text are answers to all Cumulative Review exercises, together with section and objective references, so that students know exactly what material to study if they miss a review exercise (see pages 297, 371, and 519).

*Objectives for Retesting* are covered in each Summary and Review and Chapter Test, and are also included in the Skill Maintenance exercises and in the Printed Test Bank (see pages 228, 300, and 374).

### Objectives

- a Determine whether a correspondence is a function.
- b Given a function described by an equation, find function values (outputs) for specified values (inputs).
- c Draw the graph of a function.
- d Determine whether a graph is that of a function using the vertical-line test.
- e Solve applied problems involving functions and their graphs.

### For Extra Help



TAPE 15



TAPE 4B



MAC  
WIN



CD-ROM

**For Extra Help** Many valuable study aids accompany this text. Below the list of objectives found at the beginning of each section are references to appropriate videotape, audiotape, tutorial software, and CD-ROM programs to make it easy for the student to find the correct support materials.

**Testing** The following assessment opportunities exist in the text.

The *Diagnostic Pretest*, provided at the beginning of the text, can place students in the appropriate chapter for their skill level by identifying familiar material and specific trouble areas (see page xxi).

*Chapter Pretests* can then be used to place students in a specific section of the chapter, allowing them to concentrate on topics with which they have particular difficulty (see pages 70, 148, and 452).

*Chapter Tests* allow students to review and test comprehension of chapter skills, as well as the four Objectives for Retesting from earlier chapters (see pages 221, 369, and 599).

Answers to all Diagnostic Pretest, Chapter Pretest, and Chapter Test questions are found at the back of the book, along with appropriate section and objective references.

## Supplements for the Instructor

### Annotated Instructor's Edition

0-201-33876-9

The *Annotated Instructor's Edition* is a specially bound version of the student text with answers to all margin exercises, exercise sets, and chapter tests printed in a special color near the corresponding exercises.

### Instructor's Solutions Manual

0-201-43845-3

The *Instructor's Solutions Manual* by Judith A. Penna contains brief worked-out solutions to all even-numbered exercises in the exercise sets and answers to all Thinking and Writing exercises.

### Printed Test Bank/Instructor's Resource Guide

by Donna DeSpain

0-201-43846-1

The test-bank section of this supplement contains the following:

- Three alternate test forms for each chapter, with questions in the same topic order as the objectives presented in the chapter


- Five alternate test forms for each chapter, modeled after the Chapter Tests in the text
- Three alternate test forms for each chapter, designed for a 50-minute class period
- Two multiple-choice versions of each Chapter Test
- Two cumulative review tests for each chapter, with the exception of Chapters R and I
- Eight final examinations: three with questions organized by chapter, three with questions scrambled as in the Cumulative Reviews, and two with multiple-choice questions
- Answers for the Chapter Tests and Final Examination

The resource-guide section contains the following:

- A conversion guide from the Seventh Edition to the Eighth Edition
- Extra practice exercises (with answers) for 40 of the most difficult topics in the text
- Critical Thinking exercises and answers
- Black-line masters of grids and number lines for transparency masters or test preparation
- Indexes to the videotapes and audiotapes that accompany the text
- Three-column chapter Summary and Review listing objectives, brief procedures, worked-out examples, multiple-choice problems similar to the example, and the answers to those problems
- Instructor support material for the CD-ROM

### **Collaborative Learning Activities Manual**

0-201-35993-6

The *Collaborative Learning Activities Manual*, written by Irene Doo of Austin Community College, features group activities that are tied to sections of the text via an icon . Instructions for classroom setup are also included in the manual.

### **Answer Book**

0-201-43847-X

The *Answer Book* contains answers to all exercises in the exercise sets in the text. Instructors can make quick reference to all answers or have quantities of these booklets made available for sale if they want students to have access to all the answers.

### **TestGen-EQ**

0-201-38161-3 (Windows), 0-201-38168-0 (Macintosh)

This test generation software is available in Windows and Macintosh versions. TestGen-EQ's friendly graphical interface enables instructors to easily view, edit, and add questions, transfer questions to tests, and print tests in a variety of fonts and forms. Search and sort features help the instructor quickly locate questions and arrange them in a preferred order. Six question formats are available, including short-answer, true-false, multiple-choice, essay, matching, and bimodal formats. A built-in question editor gives the instructor the ability to create graphs, import graphics, insert mathematical symbols and templates, and insert variable numbers or text. Computerized testbanks include algorithmically defined problems organized according to each textbook. An "Export to HTML" feature lets instructors create practice tests for the World Wide Web.

### QuizMaster-EQ

0-201-38161-3 (Windows), 0-201-38168-0 (Macintosh)

QuizMaster-EQ enables instructors to create and save tests and quizzes using TestGen-EQ so students can take them on a computer network. Instructors can set preferences for how and when tests are administered. QuizMaster-EQ automatically grades the exams and allows the instructor to view or print a variety of reports for individual students, classes, or courses. This software is available for both Windows and Macintosh and is fully networkable.

## Supplements for the Student


### Student's Solutions Manual

0-201-34025-9

The *Student's Solutions Manual* by Judith A. Penna contains fully worked-out solutions with step-by-step annotations for all the odd-numbered exercises in the exercise sets in the text, with the exception of the Thinking and Writing exercises. It may be purchased by your students from Addison Wesley Longman.

### "Steps to Success" Videotapes

0-201-30361-2

*Steps to Success* is a complete revision of the existing series of videotapes, based on extensive input from both students and instructors. These videotapes feature an engaging team of mathematics teachers who present comprehensive coverage of each section of the text in a student-interactive format. The lecturers' presentations include examples and problems from the text and support an approach that emphasizes visualization and problem solving. A video icon  at the beginning of each section references the appropriate videotape number.


### "Math Study Skills for Students" Videotape

0-201-84521-0

Designed to help students make better use of their math study time, this videotape help students improve retention of concepts and procedures taught in classes from basic mathematics through intermediate algebra. Through carefully-crafted graphics and comprehensive on-camera explanation, Marvin L. Bittinger helps viewers focus on study skills that are commonly overlooked.


### Audiotapes

0-201-43406-7

The audiotapes are designed to lead students through the material in each text section. Bill Saler explains solution steps to examples, cautions students about common errors, and instructs them at certain points to stop the tape and do exercises in the margin. He then reviews the margin-exercise solutions, pointing out potential errors. An audiotape icon  at the beginning of each section references the appropriate audiotape number.

### InterAct Math Tutorial Software

0-201-38105-2 (Windows), 0-201-38112-5 (Macintosh)


*InterAct Math Tutorial Software* has been developed and designed by professional software engineers working closely with a team of experienced developmental-math teachers. This software includes exercises that are linked one-to-one with the odd-numbered exercises in the text and require the same computational and problem-solving skills as their companion exercises in the text. Each exercise has an example and an interactive guided solution that are designed to involve students in the solution process and to help them identify precisely where they are having trouble. In addition, the software recognizes common student errors and provides students with appropriate customized feedback. With its sophisticated answer recognition capabilities, *InterAct Math Tutorial Software* recognizes equivalent forms of the same answer for any kind of input. It also tracks for each section student activity and scores that can then be printed out. A disk icon  at the beginning of each section identifies section coverage. *InterAct Math Tutorial Software* is available for Windows and Macintosh computers.

### World Wide Web Supplement ([www.mathmax.com](http://www.mathmax.com))

This on-line supplement provides additional practice and learning resources for the student of introductory algebra. For each book chapter, students can find additional practice exercises, Web links for further exploration, and expanded Summary and Review pages that review and reinforce the concepts and skills learned throughout the chapter. In addition, students can download a plug-in for Addison Wesley Longman's *InterAct Math Tutorial Software* that allows them to access additional tutorial problems directly through their Web browser. Students and instructors can also learn about the other supplements available for the MathMax series via sample audio clips and complete descriptions of other services provided by Addison Wesley Longman.

### MathMax Multimedia CD-ROM for Intermediate Algebra

0-201-39736-6 (Windows and Macintosh)

The Intermediate Algebra CD provides an active environment using graphics, animations, and audio narration to build on some of the unique and proven features of the MathMax series. Highlighting key concepts from the book, the content of the CD is tightly and consistently integrated with the *Intermediate Algebra* text and retains references to the *Intermediate Algebra* numbering scheme so that students can move smoothly between the CD and other *Intermediate Algebra* supplements. The CD includes Addison Wesley Longman's *InterAct Math Tutorial Software* so that students can practice additional tutorial problems. An interactive Summary and Review section allows students to review and practice what they have learned in each chapter; and multimedia presentations reiterate important study skills described throughout the book. A CD-ROM icon  at the beginning of each section indicates section coverage. The Intermediate Algebra CD is available for both Windows and Macintosh computers. Contact your Addison Wesley Longman sales consultant for a demonstration.

Your author and his team have committed themselves to publishing an accessible, clear, accomplishable, error-free book and supplements package that will provide the student with a successful learning experience and will foster appreciation and enjoyment of mathematics. As part of our continual effort to accomplish this goal, we welcome your comments and suggestions at the following email address:

Marv Bittinger  
exponent@aol.com



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M.L.B.

# Diagnostic Pretest

## Chapter R

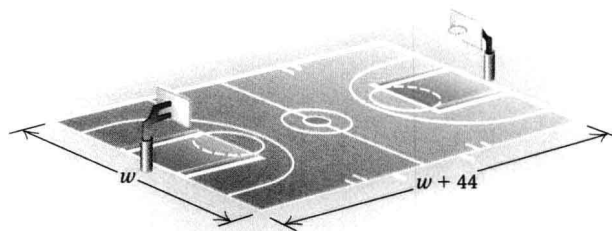
1. Subtract:  $1.45 - (-2.12)$ .
3. Simplify:  $2x - 2[x - (4 + 3x)]$ .

2. Multiply:  $-\frac{5}{6}\left(\frac{2}{15}\right)$ .
4. Simplify:  $\left[\frac{-3x^2y^{-3}}{2x^{-1}y^4}\right]^{-2}$ .

## Chapter 1

Solve.

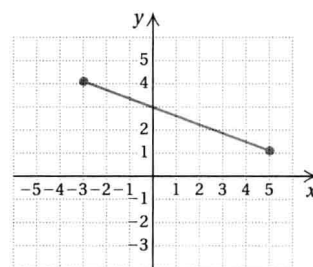
5.  $3(x + 1) = 2 - (x - 2)$
6.  $2 \leq 4 - x \leq 7$
7.  $|2x + 3| > 1$
8. Solve for  $P$ :  $A = P + Prt$ .
9. *Perimeter of NBA Court.* The perimeter of an NBA-sized basketball court is 288 ft. The length is 44 ft longer than the width. Find the dimensions of the court. (Source: National Basketball Association)



## Chapter 2

Graph on a plane.

10.  $3x - 4y = 12$
11.  $x = -1$
12.  $f(x) = 3 - x^2$
13. Find an equation of the line containing the pair of points  $(1, 3)$  and  $(-1, 5)$ .
14. Find an equation of the line containing the point  $(0, 3)$  and perpendicular to the line  $3x - y = 7$ .
15. For the function  $f$  given by  $f(x) = 3 - x^2$ , find  $f(-1)$ ,  $f(0)$ , and  $f(2)$ .
16. Find the domain and the range of the function whose graph is shown below.



## Chapter 3

17. Graph on a plane:  $3x \leq 6 - y$ .
18. Solve:  $3x - y = 5$ ,  
 $x + 2y = 3$ .
19. Solve:  $x - 4y + 2z = -1$ ,  
 $2x + y - z = 8$ ,  
 $-x - 3y + z = -5$ .
20. *Marine Travel.* A motorboat took 6 hr to make a downstream trip with a 3-mph current. The return trip against the same current took 8 hr. Find the speed of the boat in still water.
21. Graph. Find the coordinates of any vertices formed.  
 $x \geq 3$ ,  
 $x \leq 6 - 3y$ ,  
 $x - 2y \leq 6$

## Chapter 4

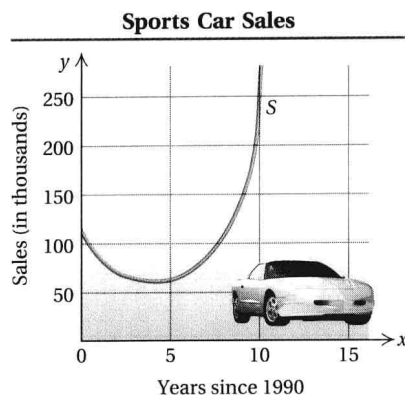
22. Multiply:  $(3x - 5y)^2$ .
23. Factor:  $x^4 - 1$ .
24. Solve:  $x^2 - 18 = 7x$ .
25. Three times the square of a number is 2 more than five times the number. Find the number.

26. **Sports Car Sales.** The sales of sports cars rise and fall due to the introduction of new or redesigned models such as the Corvette in 1997. Sales  $S$ , in thousands, for recent years can be approximated by the polynomial function

$$S(x) = 0.1x^4 - 1.6x^3 + 11.15x^2 - 38.04x + 112.65,$$

where  $x$  is the number of years since 1990.

- Use the equation to approximate sports car sales in 2000.
- Use the graph at right to approximate  $S(5)$ .



## Chapter 5

27. Divide and simplify:

$$\frac{x^2 - 9}{x^2 + 3x + 2} \div \frac{x^2 - 6x + 9}{2x + 4}.$$

29. Find the domain of the function  $f$  given by

$$f(x) = \frac{x^2 - 3x + 2}{x^2 - 9}.$$

31. **Print Work.** One folding machine in a print shop can fold an order of pamphlets in 4 hr. Another machine can do the same job in 3 hr. How long will it take if both folding machines are used?

## Chapter 6

For Questions 32–34, assume that all expressions under radicals represent nonnegative numbers.

32. Multiply and simplify:  $(\sqrt{6} + \sqrt{8x^3})(\sqrt{6} - 2\sqrt{2}y^2)$ .

34. Rationalize the denominator:  $\frac{2\sqrt{x} - \sqrt{y}}{\sqrt{x} - \sqrt{y}}$ .

36. Find the domain of the function  $f$  given by  $f(x) = \sqrt{6 - 3x}$ .

## Chapter 7

Solve.

37.  $x^2 + 2x + 5 = 0$

38.  $(x - 3)^2 + (x - 3) - 12 = 0$

39.  $\frac{x}{2} = \frac{x + 1}{x + 3}$

40. Graph  $f(x) = 2x^2 + 5x + 3$ . Label the vertex and the line of symmetry.

## Chapter 8

41. Find the inverse of  $f(x) = 2x - 5$ .

42. Graph:  $f(x) = 2^x$ .

44. Express as a single logarithm:  $\frac{1}{2} \log_3 x - \log_3 y$ .

46. Solve:  $\log_4 1 = x$ .

## Chapter 9

48. Graph:  $\frac{x^2}{25} + \frac{y^2}{9} = 1$ .

50. Solve:

$$\begin{aligned} x^2 - y^2 &= 6, \\ xy &= 4. \end{aligned}$$

28. Simplify:

$$\frac{x - \frac{1}{x}}{1 + \frac{1}{x}}.$$

30. Solve:

$$\frac{3}{x} + \frac{2}{x - 2} = \frac{1}{x}.$$

33. Add and simplify:  $\sqrt{75} + \sqrt{300} + 3\sqrt{27}$ .

35. Solve:  $\sqrt[3]{x - 5} = -2$ .

43. Graph:  $f(x) = \log_2 x$ .

45. Convert to an exponential equation:  $y = \log_2 x$ .

47. Solve:  $\log_2 (x - 1) + \log_2 (x + 1) = 1$ .

49. Graph:  $x^2 + y^2 - 6x + 4y + 9 = 0$ .