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ANSWERS TO THE WORKSHEETS

CHRISTINE VERITY

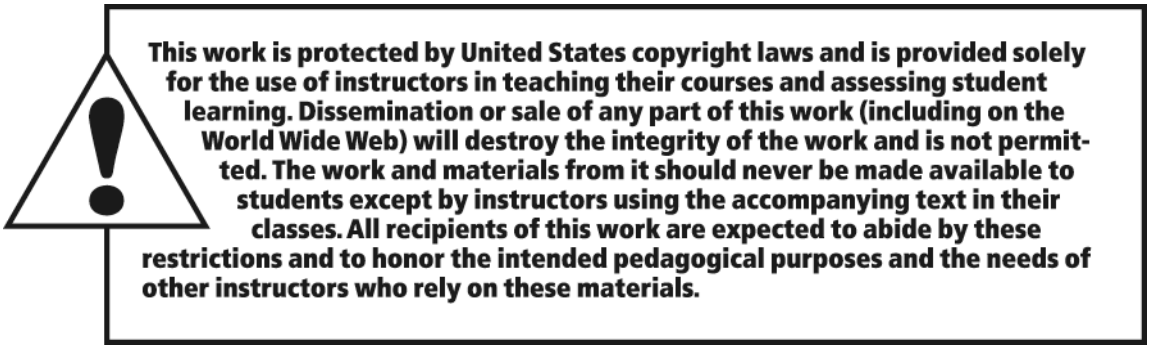
MATHEMATICS IN ACTION: ALGEBRAIC, GRAPHICAL, AND TRIGONOMETRIC PROBLEM SOLVING

SIXTH EDITION

The Consortium
for Foundation Mathematics



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Complete Answers

Chapter 1 FUNCTION SENSE

Activity 1.1

Key Terms

1. ordered pair
2. dependent
3. variable
4. independent
5. function

Practice Exercises

6. The input is x.
7. The output is $h(x)$ or y.
8. The function name is h.
9. y equals h of x.
10. The input is 7.
11. The output is 6.931.
12. The function name is g.
13. g of 7 equals 6.931.
14. The input is t.
15. The output is 762.
16. The function name is f.
17. 762 equals f of t.
18. The input is hours.
19. The output is salary.
20. The function name is s.
21. Salary is a function of hours, or salary equals s of hours.
22. $C(\text{price}) = \text{commission}$
23. (6000, 20)
24. Yes
25. Each input has only one output.
26. No
27. The input 2 has two different outputs.
28. The input 9 is paired with three different outputs.

Concept Connections

29. Answers may vary. One example is the output is the wages received.
30. No. The input, number of hours worked, is paired with 4 different outputs, wages received.

Activity 1.2

Key Terms

1. Practical range
2. Practical domain

Practice Exercises

3. $f(3) = 9$
4. $f(-2.7) = -19.5$
5. $f(c) = 5c - 6$
6. $g(4) = -90.2$
7. $g(-5.1) = -226.7$
8. $g(b) = -8b^2 + 6.2b + 13$
9. $h(6) = 11$
10. $h(-14.7) = 11$
11. $h(d) = 11$
12. $p(-2) = -2.5$
13. $p(0.5) = 10$
14. $p(a) = \dfrac{5}{a}$

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15. $r(-7) = 20.1$
16. $r(8.4) = -15.32$
17. $r(c) = 4 - 2.3c$
18. The amount of reimbursement is 0.51 times the number of miles traveled.
19. miles
20. the amount of reimbursement
21. $R(m) = 0.51m$
22. R
23. $R(74) = \$37.74$
24. Domain: all real numbers
25. Range: all real numbers
26. Practical domain may vary and is probably the real numbers from 0 to 100 miles.
27. Using the domain from Exercise #26, the range is \$0 to \$51.
28. Domain {–3, 9, 7, 4}; range: {6, 0, 4, 17}

Concept Connections

29. The domain of the function is the collection of all possible replacement values for the independent variable. The practical domain is the collection of replacement values of the independent variable that makes practical sense in the context of the situation.
30. A real number is any rational or irrational number.

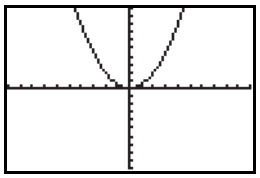
Activity 1.3

Key Terms

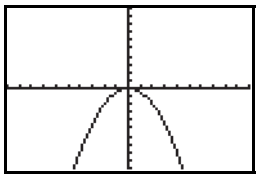
1. discrete
2. continuous
3. graphically

Practice Exercises

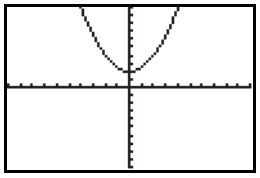
4. $y = 0.5x^2$



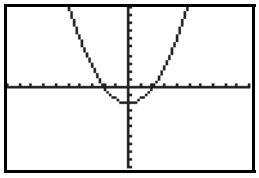
5. $y = -0.5x^2$



6. $y = 0.5x^2 + 2$



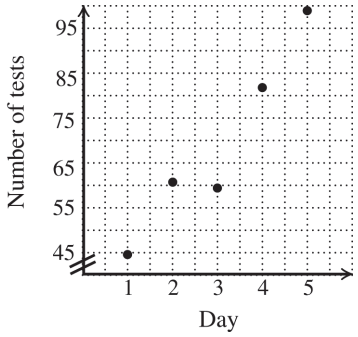
7. $y = 0.5x^2 - 2$



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8.



9. {1, 2, 3, 4, 5}

10. {44, 61, 59, 82, 98}

11. Yes

12. Since a particular day of the week is the input, the only input values that are defined are integers from 1 through 5.

13. No

14. The number of student make-up tests cannot be predicted.

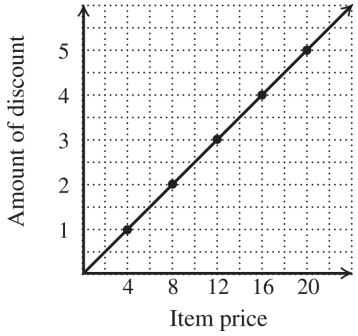
15. The employee discount on an item of food is calculated by multiplying the price of the food item by 0.25.

16. If d represents the discount amount on an item priced at p dollars, then $d = 0.25p$.

17. Answers may vary.

Item price	4	8	12	16	20
Amount of discount	1	2	3	4	5

18.

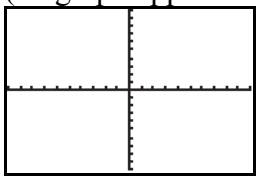


19. No

20. Since the function is defined for all values between the input values in the table, it is appropriate to connect the data points with a smooth, continuous curve.

21. $y = 0.0005x^2$

(no graph appears on screen)



22.

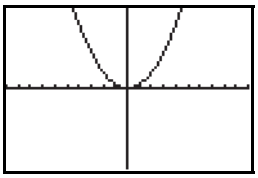
x	-3	-2	-1	0	1	2	3
y	0.0045	0.002	0.0005	0	0.0005	0.002	0.0045

23. The y values are very small. Therefore, you need to have Ymax = 0.01 and Ymin = –0.01.

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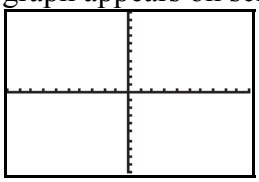
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24. $y = 0.0005x^2$



25. $y = 1000x^2$

(no graph appears on screen)

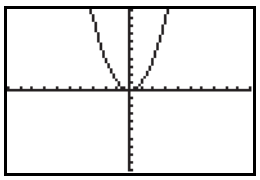


26.

x	-3	-2	-1	0	1	2	3
y	9000	4000	1000	0	1000	2000	90000

27. The y values are very large. Therefore, you need to have Ymax = 10,000 and Ymin = –10,000.

28.



Concept Connections

29. A discrete function is defined only at isolated input values, and is not defined for input values between those values. A continuous function is defined for all input values, and there are no gaps between any consecutive input values.
30. Functions can be represented verbally, symbolically, numerically and graphically.

Activity 1.4

Key Terms

1. increasing
2. mathematical model
3. constant
4. decreasing

Practice Exercises

5. What is the value of the home after a certain number of years?
6. The value of the home and the number of years of ownership.
7. the value of the home
8. the number of years of ownership
9.

Independent Variable	1	2	3	4
Dependent Variable	86,250	87,500	88,750	90,000

10. The value of the home is obtained by adding the product of 1250 and the number of years to 85,000.
11. Let v represent the value of the home and t represent the number of years.
12. $v = 85,000 + 1250t$
13. $v = 85,000 + 1250(8) = \$95,000$

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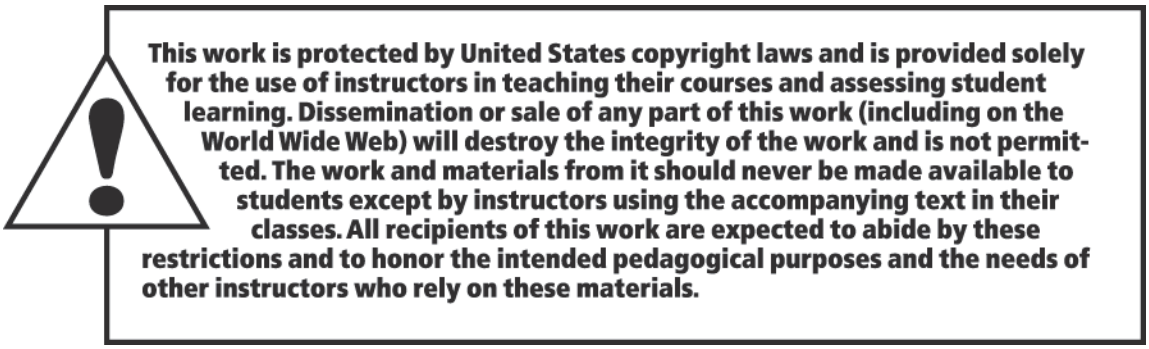
INSTRUCTOR'S RESOURCE MANUAL WITH TESTS

MATHEMATICS IN ACTION:
ALGEBRAIC, GRAPHICAL, AND TRIGONOMETRIC PROBLEM SOLVING
SIXTH EDITION

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FOREWORD

Mathematics in Action: Algebraic, Graphical, and Trigonometric Problem Solving aims to empower college students by providing them with a true mathematical literacy in the real world, and simultaneously, helping them build a secure foundation for future study in mathematics and other quantitative disciplines. This textbook grew out of a National Science Foundation grant (DUE 9455638) that enabled fourteen faculty, representing twelve SUNY and CUNY campuses, to work together over a three-year period to design a new curriculum for the traditional elementary, intermediate, and college algebra sequence. The rationale for such a project had already been articulated by national organizations and professional societies from the National Research Council's ***Everybody Counts*** to the NCTM's ***Standards*** and AMATYC's ***Crossroads.*** In addition, the NSF was funding a massive reform effort on the calculus level that would necessarily impact the courses that feed into calculus and those which follow.

The need for reform was also evident to those of us who teach foundation college mathematics. The diversity of our student body – returning adults, newly-arrived immigrants with English language deficiencies, high school graduates with a history of poor performance – coupled with the higher level quantitative literacy required of them in the workplace called for an honest and thorough re-evaluation of desired student outcomes. The fourteen co-authors agreed to formulate a wish list of topics to be included and to build a curriculum from scratch. The one basic principle to which we would adhere was that students learn mathematics best by actively ***doing*** mathematics within a clear and meaningful context.

The textbook that you are using is the result of a fifteen-year cycle of writing, meeting, piloting, and revising. The best one-word description of the text is **interactive** – short on narrative and templates, and long on structured prompts and thoughtful questions. We have carefully attempted to bridge the gap between abstraction and application by encouraging students to construct, apply, and describe their own mathematical models as they solve meaningful problems. Students are challenged to approach the material from multiple perspectives and to share their insights and strategies with one another. The language and varied contexts are geared to adults and build upon their familiarity and sophistication with the world in which we live. You will also discover that the unique "activity" structure of the text is unparalleled in supporting your efforts to foster active learning in a stimulating and cooperative environment.

STUDENT OUTCOMES

In creating a curriculum for our course, we found that most of our desired student outcomes fell naturally into six main areas:

- Developing a General Function Sense including Linear Functions
- Developing a Sense of the Algebra of Functions
- Developing Exponential and Logarithmic Function Sense
- Developing Quadratic and Higher-Order Polynomial Function Sense
- Developing Rational and Radical Function Sense
- Developing Fundamental Trigonometric Function Sense

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The word “Sense” in each of these areas conveys far more than the requisite skills’ development. It also entails developing a mathematical intuition, building techniques of reasoning, interpreting graphs and data, and communicating results or conclusions. To accomplish these enhanced goals, we have created a textbook that continuously demonstrates the relevance of mathematics in everyday life and requires the active participation of every student.

PERFORMANCE OBJECTIVES

At the conclusion of the course and in terms of specific mathematical performance we expect students to be able to:

- Define and recognize a function from a verbal, numerical, symbolic, and graphical view, including basic vocabulary and notation.
- Evaluate functions using function notation; use the basic operations with functions; recognize and determine the composition of functions; and recognize and determine inverses of specific functions algebraically, graphically, and numerically.
- Problem solve, from the context of a situation, using linear and systems of linear equations, exponential, logarithmic, quadratic, higher-order polynomials, radical, and rational equations.
- Express specific properties related to each of the following functions from a verbal, numerical, symbolic, and graphical approach: linear, absolute value, exponential, logarithmic quadratic, higher-order polynomial, radical, and rational functions.
- Use appropriate technology to visually capture the graphical representations of specific functions in order to interpret and make predictions based on the graph.
- Recognize, create, and solve inequalities relating to specific functions.
- Model specific functions and use appropriate technology to create these models.
- Problem solve using right triangle trigonometry; understand the circular behavior of trigonometric functions from a verbal, numerical, symbolic, and graphical view.

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GENERAL EDUCATION COMPETENCIES

Because mathematics is presented in realistic contextual situations ***Mathematics in Action*** promotes the development of general education competencies. By the end of the course we expect that students will be able to:

- Read technical material with facility to determine information relevant to the solution of a problem.
- Recognize that solution processes are multifaceted and use the necessary logic and formulas in a path to solution.
- Communicate solutions to problems verbally and in writing, using a logical, clear, and concise sequence of thought.
- Express solutions in writing using appropriate vocabulary, sentence structure, and persuasion.
- Demonstrate an improved comfort level when applying critical thinking and problem solving skills.
- Work collaboratively with others to enhance mathematical understanding through problem solving.
- Appreciate the importance of mathematics in everyday life and in the work place.

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SECTION 1 OVERVIEW

We hope that this *Instructor Resource Manual* will be helpful to you as you teach your course using ***Mathematics in Action.*** In this section, we provide an overview of the content, structure, supplements, and the pedagogical components of the text.

Mathematics in Action is adaptable to the various needs of courses at the intermediate and college algebra and trigonometry level and in this section we suggest some syllabi to guide you in your planning.

We organized and formatted this *Manual* so that you can use the suggested syllabi, graphing calculator experiments, journal assignments, skills checks, and exams as given.

TEXTBOOK CONTENT AND STRUCTURE

The text is divided into six chapters.

- Chapter 1: Function Sense
- Chapter 2: The Algebra of Functions
- Chapter 3: Exponential and Logarithmic Functions
- Chapter 4: Quadratic and Higher-Order Polynomial Functions
- Chapter 5: Rational and Radical Functions
- Chapter 6: Introduction to the Trigonometric Functions

- Appendix A: Concept Review
- Appendix B: Trigonometry
- Appendix C: The TI-84 Plus CE Graphing Calculator
- Appendix D: Conics Appendix

- Selected Answers
- Glossary
- Index

Each chapter is subdivided into sections we call clusters. Each cluster focuses on a major mathematical topic within the context of a chapter. For example, in Cluster 2 of Chapter 1 the focus is on linear functions, problem solving using linear functions, and linear regression. In Cluster 2 of Chapter 4 the concentration is on curve fitting and higher-order polynomial functions. Clusters also include concepts and skills other than their major focus so students learn how mathematical ideas are interconnected for problem solving.

There are thirteen clusters in all, three in Chapter 1, two in each of the other chapters. They are listed here to give you an overview.

Chapter 1: Function Sense

- Modeling with Functions

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- Linear Functions
- Systems of Linear Equations, Inequalities, and Absolute Value Functions

Chapter 2: The Algebra of Functions

- Addition, Subtraction, and Multiplication of Polynomial Functions
- Composition and Inverses of Functions

Chapter 3: Exponential and Logarithmic Functions

- Exponential Functions
- Logarithmic Functions

Chapter 4: Quadratic and Higher-Order Polynomial Functions

- Introduction to Quadratic Functions
- Curve Fitting and Higher-Order Polynomial Functions

Chapter 5: Rational and Radical Functions

- Rational Functions
- Radical Functions

Chapter 6: Introduction to the Trigonometric Functions

- Introducing the Sine, Cosine, and Tangent Functions
- Why are the Trigonometric Functions Called Circular Functions?

Each cluster is further divided into sections named

- *Activities (with Exercises)*
- *What Have I Learned?*
- *How Can I Practice?*

Activities are the **essence** of ***Mathematics in Action***. They are where mathematical concepts and skills are introduced and developed in meaningful contextual problems and situations. We expect that students will see for themselves the need to master algebra and trigonometry skills, and be able to answer their own frequently asked questions, "Why do I need to learn this?" and "When will I ever use this outside this class?"

In *Activities*, students respond to a series of structured prompts and questions that direct them to evoke and apply mathematical knowledge they already have, and that lead them to acquire the other concepts and skills they must have to be successful problem solvers. Basic algebra and trigonometry skills are

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presented as they are needed in the contextual problems. Activities also include exercises that may be assigned as additional practice in class or for homework.

A set of *Activities* in a cluster is followed by a section entitled *What Have I Learned?* As the name implies, students stop here to think about what they have learned before continuing to the next cluster. They have the opportunity to analyze and synthesize the ideas they studied in the cluster, and to test their knowledge by applying what they have learned to solve similar problems. You may want to use these sections to assess your students' progress.

How Can I Practice? sections follow *What Have I Learned?* sections to provide further opportunities for practice.

Our textbook also addresses the need for practice and preparation for gateway exams that may be required in various programs. You will find two kinds of exercise sections in the text.

- *Gateway Review*
- *Appendices A and B: Concept Review*

Six *Gateway Reviews*, one at the end of each chapter, are composed of exercises for the fundamental concepts and skills in their respective chapters. *Appendices A and B* provide algebra and trigonometry skills instruction and drill for those students who need additional help. You may want to refer students to this section when the need arises in an activity. There is also a Skills Checks Section 6 in this Instructor's Resource Manual. You may want to duplicate skills sheets on particular topics for more practice.

Appendix C is provided as an introduction to the TI-84 Plus CE graphing calculator. Calculator skills used in the text are developed in this appendix.

An answer key for selected exercises and all gateway reviews is located in the back of the textbook.

TEXTBOOK SUPPLEMENTS

A number of supplemental instructional aids are available for users of ***Mathematics in Action***.

Instructor Supplements

Annotated Instructor's Edition
ISBN 10 – 0-13-498930-3
ISBN 13 – 978-0-13-498930-9
Contains all the content found in the student edition, plus answers to all exercises directly beneath each problem and Learning Catalytics instructor annotations.

Instructor's Resource Manual with Tests
ISBN 10 – 0-13-498934-1
ISBN 13 – 978--0-13-498934-1
This valuable teaching resource includes the following materials:

- Sample syllabi suggesting ways to structure the course around core and supplemental activities.
- Sample course outlines containing timelines for covering topics.
- Teaching notes for each chapter—ideal for using the text for the first time.
- Extra skills practice worksheets for difficult topics.
- Sample chapter tests and final exams.
- Information about incorporating technology in the classroom, such as graphing calculators.

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SUPPLEMENTS FOR INSTRUCTORS AND STUDENTS

A number of supplemental instructional aids are available for users of ***Mathematics in Action***.

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PEDAGOGY

The pedagogical theme of ***Mathematics in Action*** is active learning, facilitated by emphasis on

- Reading and Writing to Learn Mathematics

Writing-to-learn strategies are built into the structure of the textbook, so students are consistently helped to think by writing, a time-honored way to learn mathematics. Section 5 of this manual presents additional writing-to-learn techniques to share with your students. As students write in a journal they give you input as to how the course is progressing. This is invaluable information especially if it is the first time you have attempted a course of this nature.

- Strategies for Problem Solving using Multiple Approaches

Students need to recognize and assimilate thinking strategies for problem solving. In Section 2, we describe our insights on the purpose and goals of individual activities, problems, and exercises sets, and the problem-solving strategies they elicit. Our intent is to provide structure in the format of the activities. However, through the activities, students are encouraged to explore and even though we have provided some strategies used in our classrooms as a guide, flexibility is the key to success.

- Collaboratively Communicating Learning with Groups and Whole Class Discussion

In the classroom, we found that the most active learning takes place in group settings with the teacher as a guide helping students find their own correct understanding of concepts. Small groups facilitate individual needs in learning, increase peer support for puzzling out solutions, and provide experience in teamwork. Whole class interactive discussions let the instructor efficiently explain key concepts and clear up common misunderstandings, give students the opportunity to develop self-confidence in learning algebraic and trigonometric skills for problem solving, and encourage the sharing and discussing of ideas in a large group setting. In Section 3 we share our experiences and offer suggestions for using collaborative learning and interactive discussion with the *Activities* and other components in the textbook.

- Use of Technology to Explore Mathematics

Computers and graphing calculators are not only tools for doing mathematics and solving problems, but they have fundamentally changed the way mathematics is taught and learned. We developed our textbook recognizing this modern pedagogical truth and you will find suggestions and ideas for using technology with the textbook in Section 4 of this manual.

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TECHNOLOGY

Technology is an integral part of the textbook and a number of tools are compatible with the activities in the course, specifically MyLab Math and MathXL.

SUGGESTED SYLLABI

Mathematics in Action: Algebraic, Graphical, and Trigonometric Problem Solving is a collection of materials in the form of real-life activities appropriate for a student's mathematical development prior to taking a pre-calculus course. Among the authors, we have adopted all or part of the book for courses in liberal arts mathematics, intermediate algebra, college mathematics, and college mathematics with trigonometry. The course outlines contained in this section represent syllabi from these courses. In all cases, the outlines should be viewed as suggestions and should be used in conjunction with the individual activity notes found in Section 2 of this manual. We encourage you to adapt them as best suits your curriculum and students.

COURSE OUTLINE FOR A LIBERAL ARTS MATHEMATICS COURSE (MEETING 3 HOURS PER WEEK FOR 15 WEEKS)

Course Description

This course is intended to enable students to view mathematics as part of their life experience by solving real-world problems using a modeling and function approach. This course is especially suitable for liberal arts/general studies, social science, humanities, and technology majors and the many majors which only require a math elective such as Communication Arts. Major topics include: an introduction to functions from a verbal, numeric, algebraic, and graphical, approach; an investigation of elementary functions (linear, exponential, logarithmic, and quadratic) through modeling and analyzing real data; and an applications approach to building and solving systems of linear equations. A specific graphing calculator is recommended and will be used throughout the course.

The following activities from the text were selected for the course. The *What Have I Learned?* and *How Can I Practices?* sections were used as extra exercises for homework throughout each chapter.

Chapter 1 Function Sense (21 hours)

Cluster 1 Modeling with Functions

- Activity 1.1 Parking Problems
  Functions; Function Notation and Terminology
- Activity 1.2 Fill 'er Up
  Defining Functions by a Symbolic Rule (Equation)
- Activity 1.3 Graphically Speaking
  Defining Functions: A Summary
- Activity 1.4 Stopping Short
  Functions as Mathematical Models

What Have I Learned?
How Can I Practice?

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Cluster 2 Linear Functions
- Activity 1.6 Walking for Fitness
  Average Rate of Change
- Activity 1.7 Depreciation
  Slope-Intercept Form of an Equation of a Line
- Activity 1.8 A New Camera
  Point-Slope Form of an Equation of a Line
- Activity 1.9 Skateboard Heaven
  General Form of an Equation of a Line
- Activity 1.10 College Tuition
  Modeling Data with Linear Regression Equations

What Have I Learned?
How Can I Practice?

Cluster 3 Systems of Linear Equations, Inequalities, and Absolute Value Functions
- Activity 1.11 Moving Out
  Systems of Linear Equations in Two Variables
- Activity 1.12 Fireworks
  Solving Systems of Linear Equations using Algebraic Methods

What Have I Learned?

How Can I Practice?
Gateway Review

Chapter 3 Exponential and Logarithmic Functions (15 hours)

Cluster 1 Exponential Functions
- Activity 3.1 Princess Charlotte and Dracula
  Increasing Exponential Functions
- Activity 3.2 Half-Life of Drugs or Medication
  Decreasing Exponential Functions
- Activity 3.3 Spotify
  More Growth and Decay Factors
- Activity 3.4 Population Growth
  Growth and Decay Rates; More Graphing
- Activity 3.5 Time is Money
  Compound Interest and Continuous Compounding
- Activity 3.6 Continuous Growth and Decay
  Problem Solving with Continuous Growth and Decay Models
- Activity 3.7 Ebola
  Modeling Data with Exponential Regression Equations

What Have I Learned?
How Can I Practice?

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Cluster 2 Logarithmic Functions
- Activity 3.8 The Diameter of Spheres
  Logarithmic and Exponential Forms
- Activity 3.9 Walking Speed of Pedestrians
  Logarithmic Functions
- Activity 3.10 Walking Speed of Pedestrians, continued
  Modeling Data with Logarithmic Regression Equations

What Have I Learned?
How Can I Practice?
Gateway Review

Chapter 4 Quadratic and Higher Order Polynomial Functions (9 hours)

Cluster 1 Introduction to Quadratic Functions
- Activity 4.1 Baseball and the Willis Tower
  Equations Defining Quadratic Functions
- Activity 4.2 The Shot Put
  Properties of Graphs of Quadratic Functions
- Activity 4.3 Spotify
  Solving Quadratic Equations Numerically and Graphically
- Activity 4.6 Heat Index
  Modeling Data with Quadratic Regression Equations

What Have I Learned?
How Can I Practice?

COURSE OUTLINE FOR INTERMEDIATE ALGEBRA (MEETING 4 HOURS PER WEEK FOR 15 WEEKS)

Course Description

This is the first course in a two-semester sequence of intermediate algebra and trigonometry. The sequence is preparatory for an introductory or survey level of calculus. Topics included will be real number systems, fundamental algebraic operations, special products and factoring, algebraic fractions, linear equations, functions, graphs, and straight lines, system of linear equations, exponents and radicals, variation, exponential and logarithmic functions, and basic quadratic equations.

The following activities from the text were selected for the course. The *What Have I Learned?* and *How Can I Practice?* sections were used as extra exercises for homework throughout each chapter.

Chapter 1 Function Sense (21 hours)

Cluster 1 Modeling with Functions
- Activity 1.1 Parking Problems
  Functions; Function Notation and Terminology
- Activity 1.2 Fill ‘er Up
  Defining Functions by a Symbolic Rule (Equation)
- Activity 1.3 Graphically Speaking
  Defining Functions: A Summary

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Activity 1.4 Stopping Short
Functions as Mathematical Models

What Have I Learned?
How Can I Practice?
Assessment

Cluster 2 Linear Functions
Activity 1.6 Walking for Fitness
Average Rate of Change
Activity 1.7 Depreciation
Slope-Intercept Form of an Equation of a Line
Activity 1.8 A New Camera
Point-Slope Form of an Equation of a Line
Activity 1.9 Skateboard Heaven
General Form of an Equation of a Line
Activity 1.10 College Tuition
Modeling Data with Linear Regression Equations

What Have I Learned?
How Can I Practice?
Assessment

Cluster 3 Systems of Linear Equations, Inequalities, and Absolute Value Functions
Activity 1.11 Moving Out
Systems of Linear Equations in Two Variables
Activity 1.12 Fireworks
Solving Systems of Linear Equations using Algebraic Methods
Activity 1.13 Manufacturing Smartphones
Solving Systems of Linear Equations in Three Variables
Activity 1.15 How Long Can You Live?
Linear Inequalities; Compound Inequalities
Activity 1.16 Working Overtime
Piecewise Linear Functions

What Have I Learned?
How Can I Practice?
Gateway Review
Assessment

Chapter 2 The Algebra of Functions (11 hours)

Cluster 1 Addition, Subtraction, and Multiplication of Polynomial Functions
Activity 2.1 Spending and Earning Money
Polynomial Functions
Activity 2.2 The Dormitory Parking Lot
Multiplication of Polynomials; Multiplicative Properties of Exponents
Activity 2.3 Stargazing
Scientific Notation; Additional Properties and Definitions of Exponents

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Activity 2.4 The Cube of a Square
Rational Exponents and *n*th Roots

What Have I Learned?
How Can I Practice?
Assessment

Cluster 2 Composition and Inverses of Functions
Activity 2.5 Inflated Balloons
Composite Functions
Activity 2.6 Finding a Bargain
Problem Solving and Using Composite Functions
Activity 2.7 Study Time
Inverse Functions
Activity 2.8 Temperature Conversions
Equations and Graphs of Inverse Functions

What Have I Learned?
How Can I Practice?
Gateway Review
Assessment

Chapter 3 Exponential and Logarithmic Functions (11 hours)

Cluster 1 Exponential Functions
Activity 3.1 Princess Charlotte and Dracula
Increasing Exponential Functions
Activity 3.2 Half-Life of Drugs or Medication
Decreasing Exponential Functions
Activity 3.3 Spotify
More Growth and Decay Factors
Activity 3.4 Population Growth
Growth and Decay Rates; More Graphing
Activity 3.5 Time is Money
Compound Interest and Continuous Compounding
Activity 3.6 Continuous Growth and Decay
Problem Solving with Continuous Growth and Decay Models
Activity 3.7 Ebola
Modeling Data with Exponential Regression Equations

What Have I Learned?
How Can I Practice?

Cluster 2 An Introduction to Logarithmic Functions
Activity 3.8 The Diameter of Spheres
Logarithmic and Exponential Forms
Activity 3.9 Walking Speed of Pedestrians
Logarithmic Functions

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Activity 3.10 Walking Speed of Pedestrians, continued
Modeling Data with Logarithmic Regression Equations
Activity 3.11 The Elastic Ball
Properties of Logarithms
Activity 3.12 Changing Demographics
Solving Exponential Equations

What Have I Learned?
How Can I Practice?
Gateway Review
Assessment

Chapter 4 Quadratic and Higher-Order Polynomial Functions (11 hours)

Cluster 1 Introduction to Quadratic Functions
Activity 4.1 Baseball and the Willis Tower
Equations Defining Quadratic Functions
Activity 4.2 The Shot Put
Properties of Graphs of Quadratic Functions
Activity 4.3 Spotify
Solving Quadratic Equations Numerically and Graphically
Activity 4.6 Heat Index
Modeling Data with Quadratic Regression Equations
Activity 4.7 Complex Numbers

What Have I Learned?
How Can I Practice?
Assessment
Cluster 2 Curve Fitting and Higher-Order Polynomial Functions
Activity 4.8 The Power of Power Functions
Direct Variation Functions and Their Graphs
Activity 4.9 Volume of a Storage Tank
Polynomial Functions and Their Graphs

Gateway Review
Assessment

Chapter 5 Rational and Radical Functions (4 hours)

Cluster 1 Rational Functions
Activity 5.1 Speed Limits
Properties and Graphs of Functions Defined by $y = \frac{k}{x}, k \neq 0$
Activity 5.2 Loudness of a Sound
Inverse Variation Functions

Assessment

Final Exam (2 hours)
Group Final Exam

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This outline will show the previous activities with suggested time frames and topics by cluster.

Chapter and Activity Sections	Topics	Suggested Time Frame (hours)
Chapter 1, Cluster 1 – Modeling with Functions, Activities 1.1 – 1.4	function notation; graphical, numerical symbolic representation of functions; domain and range; modeling data with functions	7 hours
Cluster 2 – Linear Functions, Activities 1.6 – 1.10	rate of change, slope, slope-intercept form, determining linear models from two data points, standard form of a linear equation, modeling a line of best fit, linear regression	6 hours
Cluster 3 – Systems of Linear Equations, Inequalities, and Absolute Value Functions, Activities 1.11 – 1.16	2×2 linear systems, 3×3 systems, piecewise linear functions, absolute value function, linear inequalities	8 hours
Chapter 2, Cluster 1 – Addition, Subtraction, and Multiplication of Polynomial Functions, Activities 2.1 – 2.4	addition, subtraction, and multiplication of expressions; addition, subtraction, and multiplication of functions; some properties of exponents	4 hours
Cluster 2 – Composition and Inverses of Functions, Activities 2.5 – 2.8	composition of functions, properties of exponents, fractional exponents, inverse functions, graphs of inverse functions	7 hours
Chapter 3, Cluster 1 – Exponential Functions, Activities 3.1 – 3.7	exponential functions, growth rate vs. growth factor, exponential growth/decay, continuous growth rate, natural base e	6 hours
Cluster 2 – Logarithmic Functions, Activities 3.8 – 3.12	logarithmic functions, graphs of log functions, properties of logs, natural logs, change of base formula, solving exponential and logarithmic equations	5 hours
Chapter 4, Cluster 1 – Introduction to Quadratic Functions, Activities 4.1 – 4.7	quadratic equations and their graphs, the roles of a, b, and c in the general equation, properties of quadratic functions, solving quadratic functions graphically, solving quadratic functions by factoring and the quadratic formula, complex numbers	8 hours
Cluster 2 – Curve Fitting and Higher-Order Polynomial Functions, Activities 4.8, 4.9	power functions, direct variation, polynomial functions and their graphs	3 hours
Chapter 5, Cluster 1 – Rational Functions, Activities 5.1, parts of 5.2	properties of basic rational functions, inverse variation	2 hours
Skills Sheet on Solving Rational Equations	solving equations involving rational expressions	2 hours
Evaluation (may include a midterm and a final)		2 hours
Total Hours:		60 hours

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