

Instructors Manual
Algebra and Trigonometry, 4e
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Dear Instructor,

I hope that when you read my Algebra and Trigonometry book, it will be seamless with how you teach. My goal when writing this book was for your students to hear your voice when they read it. I have taught for over 15 years and I am writing this instructors manual to help any instructor who is assigned to teaching a course that uses this textbook.

INCLUDED IN THIS MANUAL ARE

1. Top 10 Teaching Tips
2. Sample syllabus (allocation of time per topic)
3. My lesson plan for every section (similar to the notes I carry into class)

On Wiley Plus there are specific examples of my 10 teaching tips. There are also mini-lectures that I have recorded on Wiley Plus. For every chapter there is an introduction and a review/summary of key points as well as selected examples throughout the text.

Cynthia Young's Top Ten Teaching Tips

Tip	Name	Description	Benefit
1	<i>The Big Picture</i>	When starting a new chapter, show students a large flow chart of how all of the topics in the chapter fit together. Reinforce every day by showing the students the same big picture and what piece they are learning that class period.	Students don't lose the forest for the trees and achieve a better conceptual and macro level understanding.
2	<i>Balancing Skills & Concepts</i>	Example of a Skill: Graph a specific polynomial function. Example of a Concept: True or False "the graph of any polynomial function must have a y (or x-) intercept."	Students achieve both macro (conceptual) level understanding as well as micro (skills) level understanding.
3	<i>Reading the Book in Class Buys You Time</i>	Read the book with the students and talk through Examples – leaving more time for students to work in class.	Students get comfortable opening and reading their math book. Instructor has more time to engage and assess students in class.
4	<i>Engaging Students with Your Turn</i>	Immediately after talking through an Example, have students work a Your Turn individually.	Students become active (not passive) learners.
5	<i>In Class Assessment</i>	Assign (in class) a problem that has an integer in [-5,5] as an answer. The class (all at once) raises their left hand if the answer is negative, their right hand if the answer is positive, and holds up the absolute value of the number on their hand.	Instructor assesses all students- not just one student.
6	<i>Challenge: Think/Pair/Share</i>	Assign Challenge Exercises for group work in class. Apply the Think/Pair/Share method.	Raises the expectations for the course by using Challenge Exercises; Allows for peer to peer instruction.
7	<i>Catch the Mistake</i>	Assign the Catch the Mistake Exercises. Students are shown an incorrectly worked problem and are asked to identify the mistake.	Puts the student into the role of teacher; Demonstrates higher level of mastery.
8	<i>Using Wiley Plus Effectively: Read Ahead and Cumulative Assessment</i>	What are the two things we wish students would do but they don't: read the book before coming to class and continually reviewing throughout the semester. Use Wiley Plus to do both: Assign read ahead quizzes due 1 hour before class time and a biweekly cumulative assessment (questions throughout the text covered to date).	Improves retention; significant (doubling) of mastery rates.
9	<i>Get Out of Class Problem</i>	If at the end of class you assign #1-71 odd for homework, select a middle of the road EVEN problem, like #38 or #46 10 minutes prior to end of class . Students bring the solution worked out to you and if it is correct, they get out of class early, if not they sit back down and try again.	Instills students' confidence; catches mistakes <i>before</i> they propagate in homework; gives the instructor a few seconds of individual time with each student.
10	<i>Modeling Your World</i>	End of Chapter Modeling Feature with the focus on global climate change issues. Assign as individual or group projects.	Empowers students to apply functions learned in the course to Global Climate Change Issues- enabling them to be informed participants in the debate.

Algebra and Trigonometry, 4e

The following is a suggested class time allotment per section. It is expected that instructors will select some (not all) of the sections of this book during a single quarter or semester. It is expected that this book be used over two semesters.

Hours (In Class)	Section	Title
0.5	0.1	Real Numbers
0.5	0.2	Integer Exponents and Scientific Notation
0.5	0.3	Polynomials: Basic Operations
1.0	0.4	Factoring Polynomials
0.5	0.5	Rational Expressions
0.5	0.6	Rational Exponents and Radicals
1.0	0.7	Complex Numbers
4.5		Total Time for Chapter 0
1.0	1.1	Linear Equations
1.0	1.2	Applications Involving Linear Equations
1.5	1.3	Quadratic Equations
1.0	1.4	Other Types of Equations
1.0	1.5	Linear Inequalities
1.0	1.6	Polynomial and Rational Inequalities
1.0	1.7	Absolute Value Equations and Inequalities
7.5		Total Time for Chapter 1
0.5	2.1	Basic Tools: Cartesian Plane, Distance, and Midpoint
1.0	2.2	Graphing Equations: Point Plotting, Intercepts, and Symmetry
1.5	2.3	Lines
1.0	2.4	Circles
4.0		Total Time for Chapter 2
1.0	3.1	Functions
1.5	3.2	Graphs of Functions; Piecewise Defined Functions; Increasing and Decreasing Functions; Average Rate of Change
1.5	3.3	Graphing Techniques: Transformations
1.0	3.4	Operations on Functions and Composition of Functions
1.0	3.5	One-To-One Functions and Inverse Functions
0.5	3.6	Modeling Functions Using Variation
6.5		Total Time for Chapter 3
1.0	4.1	Quadratic Functions
1.5	4.2	Polynomial Functions of Higher Degree
1.0	4.3	Dividing Polynomials: Long Division and Synthetic Division
1.5	4.4	The Real Zeros of a Polynomial Function
1.0	4.5	Complex Zeros; The Fundamental Theorem of Algebra
1.0	4.6	Rational Functions
7.0		Total Time for Chapter 4

Hours (In Class)	Section	Title
1.5	5.1	Exponential Functions and Their Graphs
1.0	5.2	Logarithmic Functions and Their Graphs
1.0	5.3	Properties of Logarithms
1.5	5.4	Exponential and Logarithmic Equations
1.0	5.5	Exponential and Logarithmic Models
6.0		Total Time for Chapter 5
0.5	6.1	Angles, Degrees, and Triangles
1.0	6.2	Definition 1 of Trigonometric Functions: Right Triangle Ratios
1.0	6.3	Applications of Right Triangle Trigonometry: Solving Right Triangles
1.0	6.4	Definition 2 of Trigonometric Functions: Cartesian Plane
1.0	6.5	Trigonometric Functions of Non-Acute Angles
1.0	6.6	Radian Measure and Applications
0.5	6.7	Definition 3 of Trigonometric Functions: Unit Circle Approach
2.0	6.8	Graphs of Sine and Cosine Functions
1.0	6.9	Graphs of Other Trigonometric Functions
9.0		Total Time for Chapter 6
0.5	7.1	Basic Trigonometric Identities
1.0	7.2	Verifying Trigonometric Identities
0.5	7.3	Sum and Difference Identities
0.5	7.4	Double-Angle Identities
0.5	7.5	Half-Angle Identities
0.5	7.6	Product-to-Sum and Sum-to-Product Identities
1.5	7.7	Inverse Trigonometric Functions
2.0	7.8	Trigonometric Equations
7.0		Total Time for Chapter 7
1.0	8.1	Oblique Triangles and the Law of Sines
0.5	8.2	The Law of Cosines
0.5	8.3	The Area of a Triangle
1.0	8.4	Vectors
0.5	8.5	The Dot Product
0.5	8.6	Polar (Trigonometric) Form of Complex Numbers
1.0	8.7	Products, Quotients, Powers, and Roots of Complex Numbers
1.0	8.8	Polar Equations and Graphs
6.0		Total Time for Chapter 8
1.0	9.1	Systems of Linear Equations in Two Variables
1.0	9.2	Systems of Linear Equations in Three Variables
1.0	9.3	Partial Fractions
1.0	9.4	Systems of Linear Inequalities in Two Variables
0.5	9.5	The Linear Programming Model
4.5		Total Time for Chapter 9

Hours (In Class)	Section	Title
1.5	10.1	Matrices and Systems of Linear Equations
1.0	10.2	Matrix Algebra
1.5	10.3	Matrix Equations; The Inverse of a Square Matrix
1.0	10.4	The Determinant of a Square Matrix and Cramer's Rule
5.0		Total Time for Chapter 10
0.5	11.1	Conic Basics
1.0	11.2	The Parabola
1.0	11.3	The Ellipse
1.0	11.4	The Hyperbola
1.5	11.5	Systems of Nonlinear Equations
0.5	11.6	Systems of Nonlinear Inequalities
1.0	11.7	Rotation of Axes
1.0	11.8	Polar Equations of Conics
0.5	11.9	Parametric Equations and Graphs
8.0		Total Time for Chapter 11
1.0	12.1	Sequences and Series
1.0	12.2	Arithmetic Sequences and Series
1.0	12.3	Geometric Sequences and Series
1.0	12.4	Mathematical Induction
1.5	12.5	The Binomial Theorem
1.0	12.6	Counting, Permutations, and Combinations
1.0	12.7	Probability
7.5		Total Time for Chapter 12

0.1 Real Numbers

- Show Chapter Opener Matrix and talk about the big picture.
- Point out skills and conceptual objectives.
- Define *Rational Number*.
- The set of irrational numbers and the set of rational numbers together constitute the real numbers.
- Show diagram of sets of numbers.
- Discuss the difference between *truncating* and *rounding* a decimal.
- Talk through Example 2/Assign the Your Turn.
- Order of Operations (Please Excuse My Dear Aunt Sally): foreshadow to exponentials and discuss full order of operations.
- Talk through Example 5/ Assign the Your Turn.
- Think/Pair/Share: 0.1 #88
- Define algebraic expression, variable, coefficient, and constant.
- Talk through Example 6/Assign the Your Turn.
- Review Properties of Real Numbers and Properties of Negatives (boxes).
- Talk through Example 10 (point out common mistake)
- Discuss the Zero Product Property (tell how it will be used to solve quadratic equations).
- Discuss Fractional Properties and how to find the LCD.
- Get out of class problem: #38

Students often struggle with

- remembering to distribute the negative through all of the terms (distributive property)
- finding the LCD

0.2 Integer Exponents and Scientific Notation

- Show Chapter Opener Matrix and talk about the big picture.
- Point out skills and conceptual objectives.
- Define *exponent*, *power*, and *base*.
- Talk through Example 2 (emphasize the difference between parts a and b)/Assign the Your Turn.
- Illustrate *negative-integer exponents*.
- Talk through Example 3/Assign the Your Turn.
- Review zero-exponent property and properties of integer exponents.
- Point out Common Errors table.
- Talk through Example 5/Assign the Your Turn.
- Assign the Your Turn after Example 6.
- Talk through Example 7 and assign Your Turn (part b).
- Talk through Example 8 and assign Your Turn (part a).
- Think/Pair/Share: 0.2 #88.
- Get out of class problem: #46.

Students often struggle with

- Negative exponents
- Scientific notation with very small numbers (negative exponents).

0.3 Polynomials: Basic Operations

- Show Chapter Opener Matrix and talk about the big picture.
- Point out skills and conceptual objectives.
- Define a *polynomial*; point out *degree*, *leading coefficient*, and *constant terms*.
- Talk through Example 3 (pointing out common mistake)/Assign the Your Turn.
- Talk through Example 5 (make special mention of distributing the negatives)/Assign the Your Turn.
- Show the FOIL method for multiplying binomials.
- Point out the *difference of two squares* and *perfect squares*.
- Talk through Example 8 (pointing out common mistake). Assign the Your Turn (parts a and b) after Example 9.
- Mention formulas for the *cube of a binomial* but stress the “long way” as opposed to memorization.
- Talk through Example 12.
- Pose 0.3 #77-80 to the class one at a time. Have the class raise their right hand if they think each statement is true or their left hand if they think each statement is false.
- Get out of class problem: #54

Students often struggle with

- Finding the square of a binomial (they forget the middle term).
- Squaring a binomial of the form $(2x - 3y)^2$.

0.4 Factoring Polynomials

- Show Chapter Opener Matrix and talk about the big picture.
- Point out skills and conceptual objectives.
- Discuss the *greatest common factor* method of factoring.
- Review the Special Polynomial Forms box (*difference of two squares, perfect squares, etc.*)
- Talk through Example 2/Assign the Your Turn (part b)
- Illustrate factoring trinomials that are *perfect squares*. Talk through Example 3/Assign the Your Turn (part c).
- Discuss the trial and error method for *factoring a trinomial as a product of two binomials* (start with the leading coefficient = 1). Talk through Example 7/Assign the Your Turn.
- Talk through the three step procedure for factoring a trinomial whose leading coefficient is not equal to 1.
- Talk through Example 9/Assign the Your Turn.
- Mention prime polynomials (Irreducible) and mention that Example 10 illustrates a prime polynomial over the integers.
- Illustrate *factoring by grouping*. Talk through Example 11.
- Review *Strategy for Factoring Polynomials*.
- Talk through Example 13.
- Get out of class problem: #50.

Students often struggle with

- Factoring a trinomial whose leading coefficient is not equal to 1.

0.5 Rational Expressions

- Show Chapter Opener Matrix and talk about the big picture.
- Point out skills and conceptual objectives.
- Define a *rational expression* (compare with a rational number).
- Finding the domain of a rational expression: “what can x be?” Anything except values that make the denominator equal to zero.
- Talk through Example 2. Ask the question “what if I changed part a so that the minus in the denominator is a plus, then what is the domain of this rational expression?”
- Define: *reduced to lowest terms*.
- Discuss the common mistakes table between Examples 3 and 4.
- Talk through Example 4/Assign the Your Turn.
- Stress when multiplying or dividing rational expressions to state *domain restrictions* (both of the original expression and, in the case of division, additional domain restrictions once division is converted to multiplication of a reciprocal).
- Assign the Your Turn after Example 7 and talk them through step by step but have them do the steps. Say “factor the numerator and denominator; state domain restrictions; change division to multiplication times the reciprocal; state additional domain restrictions; cancel common factors.”
- Talk through Example 9/Assign the Your Turn (part b).
- Discuss how to find a least common denominator (LCD) of simple fractions then proceed to rational expressions.
- Work the Your Turn after Example 10.
- Read through Example 11 together noting the three domain restrictions and why each is a restriction. Then talk through the two procedures.
- Read each true or false statement (0.5 #97-100) and have students raise their right hand if they think it’s true and their left hand if they think it’s false.
- Get out of class problem: #22.

Students often struggle with

- Trying to simplify (cancel) terms in the numerator with terms in the denominator without factoring out a common factor.
- Finding the LCD for rational expressions.
- Algebra involved in complex rational expressions.