

**Course: Algebra 2**

**Instructor:** Mrs. Gillingham

**Academic year:** 2008 - 2009

**Course philosophy:** Welcome to my class! Mathematics is an extremely interesting and exciting pursuit. In this course, you have the opportunity to reinforce and extend your understanding of concepts learned in previous mathematics courses as well as to learn more sophisticated skills. Throughout the course, emphasis is placed on the processes used to find solutions, not on the solutions themselves. It is necessary to learn different problem solving strategies and to be able to explain the methods used to find solutions to problems both in oral and written form. Mathematics is a skill that requires practice, practice, practice. Also, you have opportunities to apply your mathematical knowledge and skills to real life situations via word problems. In addition, technology is used in a variety of ways to enhance learning.

**Materials required:** Text  
Graphing calculator (TI-84 Plus)  
Notebook for homework

**Classroom expectations:**

1. Come to class on time.
2. Come to class prepared. Bring all the required materials and completed homework to class each day.
3. When you arrive in class, immediately get out your homework and begin work on the indicated warm-up exercise. Do not wait for me to start class.
4. You are responsible for any material covered or announcements made during your absence.
5. Respect yourself and others. Dishonest and inappropriate behaviors are not acceptable.
6. Finally, give each task your best effort and remain positive. You may find some of the concepts and problems quite challenging, but do not give up. There is great satisfaction found in persevering until a concept is mastered! Mathematics is an extremely interesting and exciting subject to explore!

**Homework policies:**

Mathematics is a skill, and, like all skills, it must be practiced. Homework is an important part of the learning process and is assigned almost every night. All homework should be done in pencil and kept in a notebook. It must be labeled with the page number and problem numbers. You must include the work for each problem, not just the answer. Most assignments are due at the beginning of the next class period. The maximum amount of focused, uninterrupted time spent on math homework should be 30 minutes/night for a regular course and 40 minutes/night for an honors course.

**Grading procedure:**

Grades are determined by points earned out of points possible. Major tests are cumulative and are always announced; quizzes may or may not be announced. Weighting factors are as follows:

tests and quizzes 90%  
homework 10%

**Tentative Algebra 2 Schedule Text: Algebra and Trigonometry  
Structure and Method Book 2  
(Brown, Dolciani, Sorgenfrey & Kane, 2000)**

Week Chapters Sections Topics

1 1 All Basic concepts of algebra  
2 1, 2 All Basic concepts of algebra; inequalities  
3 2 All except 2.6, 2.7 Inequalities  
4 3 All Linear equations and functions  
5 3 All Linear equations and functions  
6 3 All Linear equations and functions  
7 4 All Products and factors of polynomials  
8 4 All Products and factors of polynomials  
9 4 All Products and factors of polynomials  
10 5 All except 5.3 Rational expressions  
11 5 All except 5.3 Rational expressions  
12 Review and exam

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13 5 All except 5.3 Rational expressions  
14 6 All Irrational and complex numbers  
15 6 All Irrational and complex numbers  
16 6 All Irrational and complex numbers  
17 6 All Irrational and complex numbers  
18 7 All Quadratic equations and functions  
19 7 All Quadratic equations and functions  
20 7 All Quadratic equations and functions  
21 7 All Quadratic equations and functions  
22 8 All except 8.8, 8.9 Variation and polynomial equations  
23 8 All except 8.8, 8.9 Variation and polynomial equations

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24 8 All except 8.8, 8.9 Variation and polynomial equations  
25 10 All Exponential and logarithmic functions

- 26 10 All Exponential and logarithmic functions
- 27 10 All Exponential and logarithmic functions
- 28 15 All Statistics and probability
- 29 15 All Statistics and probability
- 30 15 All Statistics and probability
- 31 11 All Sequences and series
- 32 11 All Sequences and series
- 33 11 All Sequences and series
- 34 Review
- 35 Final exam

## **Algebra 2 Outline**

### **I. Basic concepts of algebra**

- A. Language of algebra
  - 1. Types of numbers (natural, whole, integers, rational, irrational, real)
  - 2. Graphing on a number line
  - 3. Review of basic definitions
  - 4. Review of basic principles (substitution, order of operations)
- B. Operating with real numbers
  - 1. Review of properties
  - 2. Review of operations (addition, subtraction, multiplication, division)
- C. Solving equations and problems
  - 1. Solving equations in one variable
  - 2. Translating words into symbols
  - 3. Plan for solving a word problem

### **II. Inequalities**

- A. Solving inequalities in one variable
  - 1. Properties of Order
    - a. Comparison
    - b. Transitive
    - c. Addition
    - d. Multiplication
  - 2. Transformations that produce equivalent inequalities
  - 3. Combined inequalities
    - a. Conjunction
    - b. Disjunction
  - 4. Applications (word problems)
- B. Working with absolute value
  - 1. Absolute value in open sentences
  - 2. Solving absolute value sentences graphically

### III. Linear equations and functions

- A. Open sentences in two variables
  - 1. Ordered pair
  - 2. Finding solutions of open sentences in two variables
  - 3. Applications (word problems)
- B. Graphing linear equations in two variables
  - 1. Basic vocabulary
  - 2. Slope of a line
  - 3. Forms of a line
    - a. Standard
    - b. Slope-intercept
    - c. Point-slope
  - 4. Graphing
    - a. By plotting points
    - b. By finding  $x$ - and  $y$ -intercepts
    - c. By using slope and  $y$ -intercept
- C. Finding an equation of a line
  - 1. Given its slope and a point on the line
  - 2. Given two points on the line
- D. Parallel and perpendicular lines
- E. Linear systems
  - 1. Methods of solving
    - a. Graphing
    - b. Substitution
    - c. Linear combination
  - 2. Consistent, inconsistent
  - 3. Using systems to solve word problems
  - 4. Graphing a system of linear inequalities in two variables
- F. Functions
  - 1. Mapping diagram
  - 2. Domain
  - 3 Range
  - 4. Notation
  - 5. Finding values of functions
  - 6. Graphing
  - 7. Types
    - a. Greatest-integer
    - b. Signum
    - c Linear
    - d. Constant
  - 8. Difference between a function and a relation
  - 9. Vertical-Line Test

## **IV. Products and factors of polynomials**

### A. Working with polynomials

1. Basic vocabulary
2. Adding and subtracting polynomials
3. Using laws of exponents to multiply a polynomial by a monomial
4. Multiplying polynomials (FOIL method)

### B. Factors of polynomials

1. Using prime factorization
    - a. Greatest common factor (GCF)
    - b. Least common multiple (LCM)
  2. Factoring
    - a. Factoring out the GCF
    - b. Recognizing special products
      - i. Difference of two squares
      - ii. Perfect square trinomials
      - iii. Sum and difference of cubes
    - c. Factoring by grouping
    - d. Factoring quadratic polynomials that are not perfect squares
    - e. Factoring completely
- ### C. Applications of factoring
1. Solving polynomial equations
    - a. Zero-Product Property
    - b. Multiple roots
  2. Using polynomial equations to solve word problems
  3. Using sign graphs to solve polynomial inequalities

## **V. Rational expressions**

### A. Using the laws of exponents

1. Multiplication rule for fractions
2. Simplifying quotients of monomials
3. Zero and negative exponents

### B. Rational algebraic expressions

1. Simplifying
2. Finding domain
3. Finding zeros
4. Graphing rational functions
5. Multiplying and dividing
6. Adding and subtracting
7. Complex fractions

### C. Problem solving using fractional equations

1. Solving equations and inequalities having fractional coefficients

2. Solving fractional equations
3. Recognizing extraneous roots
4. Applications (word problems)

## **VI. Irrational and complex numbers**

- A. Roots and radicals
  1. Basic vocabulary and definitions
  2. Finding roots of real numbers
  3. Properties of radicals
    - a. Product Property
    - b. Quotient Property
  4. Rationalizing the denominator
  5. Simplest radical form
  6. Sums of radicals
  7. Binomials containing radicals
    - a. Simplifying products
    - b. Simplifying quotients
    - c. Conjugates
  8. Solving equations containing radicals
  9. Recognizing extraneous roots
- B. Real numbers and complex numbers
  1. Rational and irrational numbers
    - a. Completeness Property of Real Numbers
    - b. Decimal representations
  2. The imaginary number  $i$ 
    - a. Definition
    - b. Square roots of negative numbers
  3. Complex numbers
    - a. Definition
    - b. Equality of complex numbers
    - c. Operations involving complex numbers
      - i. Addition
      - ii. Subtraction
      - iii. Multiplication
      - iv. Division (using complex conjugates)
    - d. Finding reciprocals

## **VII. Quadratic equations and functions**

- A. Solving quadratic equations
  1. By completing the square
  2. By using the quadratic formula
- B. Roots of quadratic equations

1. Using the discriminant to determine the nature of roots
2. Test for rational roots
- C. Recognizing and solving equations in quadratic form
- D. Graphing parabolas
  1. Forms
    - a. Standard
    - b. Completed-square
  2. Finding vertices
  3. Finding axes of symmetry
  4. Opening up or down
  5. Width of parabola
  6. Translations of parabolas
  7. Finding intercepts and zeros
  8. Minimum or maximum values
  9. Finding domain and range
- E. Finding an equation of a quadratic
  1. Relationship between roots and coefficients of a quadratic equation
  2. Given two roots
  3. Given information about the graph
- F. Applications (word problems)

## **VIII. Variation and polynomial equations**

- A. Variation and proportion
  1. Direct
    - a. Definition
    - b. Means and extremes
    - c. Mean proportional or geometric mean
    - d. Applications (word problems)
  2. Inverse
    - a. Definition
    - b. Applications (word problems)
  3. Joint
    - a. Definition
    - b. Applications (word problems)
- B. Polynomial equations
  1. Dividing polynomials
    - a. Polynomial long division
    - b. Synthetic division
  2. Useful theorems
    - a. Remainder Theorem
    - b. Factor Theorem
    - c. Theorem concerning number of roots
    - d. Conjugate Root Theorem

- e. Descartes' Rule of Signs
- f. Rational Root Theorem

## **IX. Exponential and logarithmic functions**

- A. Exponential functions
  - 1. Rational exponents
    - a. Definition
    - b. Conversion between exponential form and simplest radical form
  - 2. Irrational exponents
  - 3. Solving exponential equations
- B. Composition of functions
- C. Inverse functions
  - 1. Definition
  - 2. Horizontal-Line Test
- D. Logarithmic functions
  - 1. Definition of common logarithm
  - 2. Relationship to exponential functions
  - 3. Laws of logarithms
  - 4. Applications of logarithms
    - a. Using common logarithms to solve equations involving powers
    - b. Change-of-Base Formula
    - c. Exponential growth and decay
      - i. Compound Interest Formula
      - ii. Doubling-Time Growth Formula
      - iii. Half-Life Decay Formula
  - 5. Natural logarithm and  $e$

## **X. Statistics and probability**

- A. Statistics
  - 1. Presenting statistical data
    - a. Frequency distribution
    - b. Histogram
    - c. Stem-and-leaf plot
    - d. Box-and-whisker plot
  - 2. Measures of central tendency
    - a. Mean
    - b. Median
    - c. Mode
  - 3. Measures of dispersion
    - a. Range
    - b. First and third quartiles
    - c. Variance

- d. Standard deviation
- 4. Normal distribution
  - a. Standard normal distribution
  - b. Finding  $z$ -scores
- 5. Correlation
  - a. Drawing scatter plots
  - b. Determining correlation coefficients
  - c. Finding and using linear regression lines
- B. Counting
  - 1. Fundamental counting principles
  - 2. Permutations
    - a. Definition of  $n!$
    - b. Formula
    - c. Symbol and how to read it
    - d. Finding the number of permutations of the elements of a set
  - 3. Combinations
    - a. Formula
    - b. Symbol and how to read it
    - c. Finding the number of combinations of the elements of a set
- C. Probability
  - 1. Sample spaces and events for random experiments
  - 2. Finding the probability that an event will occur
  - 3. Venn diagrams
    - a. Intersection of sets
    - b. Union of sets
    - c. Disjoint sets
    - d. Complement of a given set
  - 4. Mutually exclusive events and their probability
  - 5. Independent events and their probability

## **XI. Sequences and series**

- A. Arithmetic
  - 1. Definition
  - 2. Common difference
  - 3. Finding a formula for the  $n$ th term
  - 4. Finding specified terms
  - 5. Arithmetic means
- B. Geometric
  - 1. Definition
  - 2. Common ratio
  - 3. Finding a formula for the  $n$ th term
  - 4. Finding specified terms
  - 5. Geometric means

C. Applications (word problems)

D. Series and sigma notation

E. Sums of finite arithmetic and geometric series

F. Infinite geometric series

G. Binomial expansions