

MORENO VALLEY HIGH SCHOOL ALGEBRA II CURRICULUM

Course Title: Algebra II Course Number: 2041

Department: Mathematics ADS Number: 2041

Prerequisites: Successful completion of Algebra I with a D- or better

Length of Course: Year long Credit/PRI Area: .5 credit per semester Grade Level(s): 9-12

COURSE DESCRIPTION

The purpose of the Algebra II course is to expand on the skills acquired in Algebra I and apply them to more challenging and varied operations. It begins with a review of solving equations and inequalities. There is in-depth exploration of writing equations of lines, radicals and rational exponents, quadratic functions, and exponential and logarithmic functions. The graphing of conic sections including parabolas, hyperbolas, circles and ellipses is also covered.

SYLLUBUS

Topics Covered:

1. Equations, Inequalities, and Factoring
 - Review of Equations and Inequalities
 - Equations containing Absolute Values
 - Inequalities containing Absolute Values
 - Review of Factoring
 - Factoring the Sum and Difference of Two Cubes
 - Review of Rational Expressions
 - Synthetic Division
2. Writing Equations of Lines
 - Review of the Cartesian Coordinate System
 - Slope of a Nonvertical Line
 - Writing Equations of Lines
 - A Review of Functions
 - Graphs of Nonlinear Functions
3. Radicals and Rational Exponents
 - Radical Expressions
 - Applications of Radicals
 - Rational Exponents
 - Simplifying and Combining Radical Expressions
 - Multiplying and Dividing Radical Expressions
 - Radical Equations
4. Quadratic Functions, Inequalities, and Algebra of Functions

- Completing the Square and the Quadratic Formula
- Graphs of Quadratic Functions
- Complex Numbers
- The Discriminant and Equations that can be written in Quadratic Form
- Quadratic and other Nonlinear Inequalities
- Algebra and Composition of Functions
- 5. Exponential and Logarithmic Functions
 - Exponential Functions
 - Logarithmic Functions
 - Properties of Logarithms
 - Exponential and Logarithmic Equations
- 6. Graphing of Conic Sections
 - The Circle and Parabola
 - The Ellipse
 - The Hyperbola

Skills Emphasized:

1. Problem Solving
2. Critical Thinking
3. Manipulation of Fractions
4. Reading Comprehension
5. Understanding Logical Process
6. Seminar
7. Group Work

STRATEGIES

Begin a new lesson with a question and answer session regarding the new topic to access prior knowledge.

Read through the text that applies to the new lesson and work sample problems posing questions to seek support from students.

Address student questions throughout the demonstration process.

Assign problems for students to practice new concepts individually or in groups.

Continue demonstrating new concepts by working more challenging problems from assignment asking questions to seek student support and involvement.

Move throughout classroom monitoring progress of students' work and answering specific questions.

At the start of next class offer to support students at the white board working most challenging problems from previous days assignment.

ASSESSMENTS

Daily homework assignments

Weekly or biweekly quizzes consisting of 5-10 questions addressing the past homework assignments

Unit tests given every 4-6 weeks

Class participation

Quarterly seminars to address more complicated real world applications

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS

Beginning and Intermediate Algebra, 3rd Edition, An Integrated Approach by Gustafson/Frisk

SUGGESTED TITLES/AUTHORS WEB SITES

None

SEMINAR PIECES OR USE: Complex word problems chosen from text

STRAND II: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD 2: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

A. BENCHMARK: *Represent and analyze mathematical situations and structures using algebraic symbols.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>1. Classify numbers and members of the following sets:</p> <ul style="list-style-type: none">• natural• whole• integers• rationals• irrationals <p>2. Simplify numerical expressions using the order of operations, including exponents.</p> <p>3. Evaluate the numerical value of expressions of one or more variables that are:</p> <ul style="list-style-type: none">• polynomial• rational• radical <p>4. Simplify algebraic monomial expressions raised to a power (e.g., $[5 \times y^2]^3$) and algebraic binomial (e.g., $[5x^2 + y]^2$) expressions raised to a power.</p> <p>5. Compare and order polynomial expressions by degree.</p> <p>6. Represent and analyze relationships using written and verbal expressions, tables, equations, and graphs, and describe the connections among those representations:</p> <ul style="list-style-type: none">• Translate from verbal expression to algebraic formulae (e.g., 'Set up the equations that represent the data in the following equation: John's father is 23 years older than John. John is 4 years older than his sister Jane. John's mother is 3 years younger than John's father. John's mother is 9 times as old as Jane. How old are John, Jane, John's mother, and John's father?')• given data in a table, construct a function that represents these data (linear only)• given a graph, construct a function that represents the graph (linear only) <p>7. Know, explain, and use equivalent representations for the same real number</p>	<p>Chapter 9.1 Radical Expressions</p> <p>Chapter 7.4 Review of Factoring Demonstrate the process by working through examples and then assigning problems for practice.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>including:</p> <ul style="list-style-type: none"> • integers • decimals • percents • ratios • scientific notation • numbers with integer exponents • inverses (reciprocal) • prime factoring <p>8. Simplify algebraic expressions using the distributive property.</p> <p>9. Explain and use the concept of absolute value.</p> <p>10. Know, explain, and use equivalent representations for algebraic expressions.</p> <p>11. Simplify square roots and cube roots with monomial radicands that are perfect squares or perfect cubes (e.g., $9a^2x^4$).</p> <p>12. Calculate powers and roots of real numbers, both rational and irrational.</p> <p>13. Solve:</p> <ul style="list-style-type: none"> • formulas for specified variables • radical equations involving one radical <p>14. Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.</p> <p>15. Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.</p> <p>16. Manipulate simple expressions with + and - exponents.</p> <p>17. Use the four basic operations (+, -, x, /) with:</p> <ul style="list-style-type: none"> • linear expressions • polynomial expressions • rational expressions <p>B. Understand patterns, relations, functions, and graphs.</p> <p>1. Distinguish between the concept of a relation and a function.</p> <p>2. Determine whether a relation defined by a graph, a set of ordered pairs, a table of values, an equation, or a rule is a function.</p> <p>3. Describe the concept of a graph of a function.</p> <p>4. Translate among tabular, symbolic, and graphical representations of functions.</p> <p>5. Explain and use function notation.</p> <p>6. Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.</p> <p>7. Identify the independent and dependent variables from an application problem (e.g., height of a child).</p> <p>8. Describe the concept of a graph of an equation.</p> <p>9. Understand symmetry of graphs.</p>	<p>Chapter 7.5 Factoring the Sum and Difference of Two Cubes Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 7.6 Rational Expressions Demonstrate the process by working through examples and then assigning problems for practice.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>10. Analyze and describe middle and end (asymptotic) behavior of linear, quadratic, and exponential functions, and sketch the graphs of functions.</p> <p>11. Work with composition of functions (e.g., find f of g when $f(x) = 2x - 3$ and $g(x) = 3x - 2$), and find the domain, range, intercepts, zeros, and local maxima or minima of the final function.</p> <p>12. Use the quadratic formula and factoring techniques to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points.</p> <p>13. Apply quadratic equations to physical phenomena (e.g., the motion of an object under the force of gravity).</p> <p>C. Use mathematical models to represent and understand quantitative relationships.</p> <p>1. Model real-world phenomena using linear and quadratic equations and linear inequalities (e.g., apply algebraic techniques to solve rate problems, work problems, and percent mixture problems; solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest; apply quadratic equations to model throwing a baseball in the air).</p> <p>2. Use a variety of computational methods (e.g., mental arithmetic, paper and pencil, technological tools).</p> <p>3. Express the relationship between two variables using a table with a finite set of values and graph the relationship.</p> <p>4. Express the relationship between two variables using an equation and a graph: graph a linear equation and linear inequality in two variables solve linear inequalities and equations in one variable solve systems of linear equations in two variables and graph the solutions use the graph of a system of equations in two variables to help determine the solution</p> <p>5. Solve applications involving systems of equations.</p> <p>6. Evaluate numerical and algebraic absolute value expressions.</p> <p>7. Create a linear equation from a table of values containing co-linear data.</p> <p>8. Determine the solution to a system of equations in two variables from a given graph.</p> <p>9. Generate an algebraic sentence to model real-life situations.</p> <p>10. Write an equation of the line that passes through two given points.</p> <p>11. Understand and use: such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power the rules of exponents</p> <p>12. Verify that a point lies on a line, given an equation of the line, and be able to derive linear equations by using the point-slope formula.</p> <p>D. Analyze changes in various contexts.</p> <p>1. Analyze the effects of parameter changes on these functions:</p>	<p>Chapter 10.1 Completing the Square and the Quadratic Formula Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 11.1 Exponential Functions – Compound Interest</p> <p>Chapter 8.3 Writing Equations of Lines Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 8.3 Writing Equations of Lines Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 8.3 Writing Equations of Lines</p>

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	<p>linear (e.g., changes in slope or coefficients) quadratic (e.g., $f[x-a]$ changes coefficients and constants) exponential (e.g., changes caused by increasing $x[x + c]$ or $[ax]$) polynomial (e.g., changes caused by positive or negative values of a, or in a constant c)</p> <p>2. Solve routine two- and three-step problems relating to change using concepts such as: exponents factoring ratio proportion average percent</p> <p>3. Calculate the percentage of increase and decrease of a quantity. 4. Analyze the general shape of polynomial expressions and equations for different degree polynomials (e.g., positive and negative general shapes for third-, fourth-, and fifth-degree polynomials). 5. Estimate the rate of change of a function or equation by finding the slope between two points on the graph. 6. Evaluate the estimated rate of change in the context of the problem. 7. Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers.</p>	<p>Chapter 8.2 Slope of a Nonvertical Line Demonstrate the process by working through examples and then assigning problems for practice. Chapter 14.1 Pascal's Triangle Demonstrate the process by working through examples and then assigning problems for practice</p>

STRAND II: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD 2: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

B. BENCHMARK: Understand patterns, relations, functions, and graphs.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
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GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Distinguish between the concept of a relation and a function. 2. Determine whether a relation defined by a graph, a set of ordered pairs, a table of values, an equation, or a rule is a function. 3. Describe the concept of a graph of a function. 4. Translate among tabular, symbolic, and graphical representations of functions. 5. Explain and use function notation. 6. Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression. 7. Identify the independent and dependent variables from an application problem (e.g., height of a child). 8. Describe the concept of a graph of an equation. 9. Understand symmetry of graphs. 10. Analyze and describe middle and end (asymptotic) behavior of linear, quadratic, and exponential functions, and sketch the graphs of functions. 11. Work with composition of functions (e.g., find f of g when $f(x) = 2x - 3$ and $g(x) = 3x - 2$), and find the domain, range, intercepts, zeros, and local maxima or minima of the final function. 12. Use the quadratic formula and factoring techniques to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points. 13. Apply quadratic equations to physical phenomena (e.g., the motion of an object under the force of gravity). 	<p>Chapter 8.4 A Review of Functions Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 10.1 Completing the Square and the Quadratic Formula Demonstrate the process by working through examples and then assigning problems for practice.</p>

STRAND II: ALGEBRA, FUNCTIONS, AND GRAPHS

CONTENT STANDARD 2: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

C. BENCHMARK: *Use mathematical models to represent and understand quantitative relationships.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Model real-world phenomena using linear and quadratic equations and linear inequalities (e.g., apply algebraic techniques to solve rate problems, work problems, and percent mixture problems; solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest; apply quadratic equations to model throwing a baseball in the air). 2. Use a variety of computational methods (e.g., mental arithmetic, paper and pencil, technological tools). 3. Express the relationship between two variables using a table with a finite set of values and graph the relationship. 4. Express the relationship between two variables using an equation and a graph: 	<p>Chapter 11.1 Exponential Functions – Compound Interest Demonstrate the process by working through examples and then assigning problems for practice.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ul style="list-style-type: none"> • graph a linear equation and linear inequality in two variables • solve linear inequalities and equations in one variable • solve systems of linear equations in two variables and graph the solutions • use the graph of a system of equations in two variables to help determine the solution <p>5. Solve applications involving systems of equations.</p> <p>6. Evaluate numerical and algebraic absolute value expressions.</p> <p>7. Create a linear equation from a table of values containing co-linear data.</p> <p>8. Determine the solution to a system of equations in two variables from a given graph.</p> <p>9. Generate an algebraic sentence to model real-life situations.</p> <p>10. Write an equation of the line that passes through two given points.</p> <p>11. Understand and use:</p> <ul style="list-style-type: none"> • such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power • the rules of exponents <p>12. Verify that a point lies on a line, given an equation of the line, and be able to derive linear equations by using the point-slope formula.</p>	<p>Chapter 8.3 Writing Equations of Lines Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 8.3 Writing Equations of Lines Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 8.3 Writing Equations of Lines Demonstrate the process by working through examples and then assigning problems for practice.</p>

STRAND II: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD 2: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

D. BENCHMARK: Analyze changes in various contexts.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>1. Analyze the effects of parameter changes on these functions:</p> <ul style="list-style-type: none"> • linear (e.g., changes in slope or coefficients) • quadratic (e.g., $f[x-a]$ changes coefficients and constants) • exponential (e.g., changes caused by increasing $x[x + c]$ or $[ax]$) • polynomial (e.g., changes caused by positive or negative values of a, or in a constant c) <p>2. Solve routine two- and three-step problems relating to change using concepts such as:</p> <ul style="list-style-type: none"> • exponents • factoring 	

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ul style="list-style-type: none"> • ratio • proportion • average • percent <p>3. Calculate the percentage of increase and decrease of a quantity.</p> <p>4. Analyze the general shape of polynomial expressions and equations for different degree polynomials (e.g., positive and negative general shapes for third-, fourth-, and fifth-degree polynomials).</p> <p>5. Estimate the rate of change of a function or equation by finding the slope between two points on the graph.</p> <p>6. Evaluate the estimated rate of change in the context of the problem.</p> <p>7. Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers.</p>	<p>Chapter 8.2 Slope of a Nonvertical Line Demonstrate the process by working through examples and then assigning problems for practice.</p> <p>Chapter 14.1 Pascal's Triangle Demonstrate the process by working through examples and then assigning problems for practice</p>