

**Union County Educational Services Commission
High School Course Syllabus**

Title: Algebra II

Timeline: Full Year; 5 Credits

Course Description:

Students taking Algebra 2 will continue to build upon skills learned in Algebra 1. They will review solving linear equations both algebraically and graphically. Students will solve systems of equations and inequalities using different methods. Students working in Algebra 2 will work with functions and relations, demonstrating how they can create them and apply them to real world situations. Students will be exposed to matrices, and basic arithmetic operations associated with them. This course will also work with more advanced topics working with quadratics and polynomials.

Scope and Sequence:

- I. Linear Functions/Systems, Quadratic Functions
- II. Laws of Exponents, Polynomials and Factoring
- III. Rational Functions, Exponential and Logarithmic Functions
- IV. Matrices and Complex Numbers

Refer to the attached curriculum map for a detailed outline of course objectives.

Curriculum Alignment:

New Jersey Student Learning Standards – Mathematics

Grading Procedures:

Do Now	10%
Participation	20%
Class Assignments	50%
Assessments	20%

Adoption Date:

June 2024

**Union County Educational Services Commission
Curriculum Mapping – Algebra II**

Topics	UNIT 1 - Linear Functions/Systems, Quadratic Functions	UNIT 2 - Laws of Exponents, Polynomials and Factoring	UNIT 3 - Rational Functions, Exponential and Logarithmic Functions	UNIT 4 - Matrices and Complex Numbers
Length of Unit	approx. 8-11 weeks	approx. 8-11 weeks	approx. 8-11 weeks	approx. 8 weeks
Essential Question(s) and/or Big Idea(s)	How can algebraic functions be used to model and solve real-life problems?	How do you write general rules involving properties of exponents and polynomials?	How can a non-linear function be used to model a real-world situation?	How do complex numbers and matrices expand our abilities to solve problems?
Target Standards (a)	<p>A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>A.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.</p> <p>A-REI.B.3 Solve linear equations and inequalities in one</p>	<p>N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.</p> <p>N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.</p> <p>F-IF.C.8 Write a function defined by an expression in different but equivalent</p>	<p>N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.</p> <p>N-APR.D.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and</p>	<p>A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations...and...intersect are the solutions of the equation...; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where...and/or...are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> <p>N.CN.A.1 Know there is a complex number i such that...and</p>

	<p>variable, including equations with coefficients represented by letters.</p> <p>A-REI.B.4 Solve quadratic equations in one variable.</p> <p>A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations...and...intersect are the solutions of the equation...; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where...and/or...are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> <p>A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the</p>	<p>forms to reveal and explain different properties of the function.</p> <p>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions.</p> <p>A-SSE.A.1.a-b Interpret expressions that represent a quantity in terms of its context.</p> <p>a. Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p>b. Interpret complicated</p>	<p>divide rational expressions.</p> <p>A-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.</p> <p>A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations...and...intersect are the solutions of the equation...; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where...and/or...are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> <p>F-BF.A.1 Write a function that describes a relationship between two quantities.</p>	<p>every complex number has the form...with...and real.</p> <p>N.CN.A.2 Use the relation...and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.</p> <p>N-VM.C.6 Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.</p> <p>N-VM.C.8 Add, subtract, and multiply matrices of appropriate dimensions.</p>
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	<p>quantity represented by the expression.</p> <p>F-IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.</p> <p>F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</p> <p>F-IF.C.7.a-f Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p>a. Graph linear and quadratic</p>	<p>expressions by viewing one or more of their parts as a single entity.</p> <p>A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.</p>	<p>F-BF.A.1.b Combine standard function types using arithmetic operations.</p> <p>F-BF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</p> <p>F-BF-B.4.a Solve an equation of the form...for a simple function f that has an inverse and write an expression for the inverse.</p> <p>F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p>	
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	<p>functions and show intercepts, maxima, and minima.</p> <p>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> <p>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</p> <p>d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</p> <p>e. Graph exponential and logarithmic functions, showing</p>		<p>F-IF.C.7.b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> <p>F-IF.C.7.e Graph exponential and logarithmic functions, showing intercepts and end behavior.</p> <p>F-IF.C.7.f Graph trigonometric functions, showing period, midline, and amplitude.</p> <p>F-LE.A.4 Find inverse functions.</p>	
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	<p>intercepts and end behavior.</p> <p>f. Graph trigonometric functions, showing period, midline, and amplitude.</p> <p>F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>b. Use the properties of exponents to interpret expressions for</p>			
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	exponential functions.			
Standards for Mathematical Practice	<p>MP.1 Make sense of problems and persevere in solving them.</p> <p>MP.2 Reason abstractly and quantitatively.</p> <p>MP.3 Construct viable arguments & critique the reasoning of others.</p> <p>MP.4 Model with mathematics.</p> <p>MP.5 Use appropriate tools strategically.</p> <p>MP.6 Attend to precision.</p> <p>MP.7 Look for and make use of structure.</p> <p>MP.8 Express regularity in repeated reasoning.</p>			
Content	<p>Rate of Change</p> <p>Slope</p> <p>Intercept Form</p> <p>Vertical and Horizontal Lines</p> <p>Writing Equations of Lines</p> <p>Point Slope Form</p> <p>Slope Intercept Form</p> <p>Standard Form</p> <p>Parallel Lines</p> <p>Perpendicular Lines</p> <p>One solution, No Solution, Infinitely Many Solutions.</p> <p>Substitution Method</p> <p>Graphing Method</p> <p>Elimination Method</p>	<p>Properties of exponents</p> <p>Scientific Notation</p> <p>Exponential Functions</p> <p>Exponential Growth</p> <p>Exponential Decay</p> <p>Division Property (Quotient of Powers Property)</p> <p>Division Property (Positive Power of a Quotient Property)</p> <p>Division Property (Negative Power of a Quotient Property)</p> <p>Standard Form Factoring</p> <p>Greatest Common Factor (GCF)</p>	<p>Rational Expressions</p> <p>Operations with Rational Expressions</p> <p>The formulas for Exponential Growth</p> <p>Exponential Decay</p> <p>Interest Rate</p> <p>Compound Interest</p> <p>Properties of Logarithms</p> <p>Logarithmic Applications</p> <p>PH Scale</p> <p>Bacteria</p> <p>Logarithmic Equations</p> <p>Natural Logarithms</p> <p>Irrational Number "e"</p>	<p>Properties of Matrices</p> <p>Operations with Matrices (Addition, subtraction, scalar multiplication)</p> <p>Operations with Matrices (multiply 3x3 matrices)</p> <p>Solving systems of equations using matrices</p> <p>Simplify the square roots of negative numbers.</p> <p>Add, subtract, and multiply complex numbers.</p> <p>Find the conjugate of a complex number.</p> <p>Divide complex numbers, including rationalization</p>

	<p>Quadratics can model real-world problems.</p> <p>Key features of quadratic functions</p> <p>Intercepts</p> <p>Intervals of increasing or decreasing</p> <p>Relative maximums and Minimums</p> <p>Role of Symmetry</p>	<p>Monomial Binomial Trinomial Polynomial</p> <p>Difference of Squares</p> <p>Perfect Square Trinomial</p> <p>Factoring quadratics</p> <p>The Quadratic Formula</p> <p>Completing the Square</p> <p>Role technology plays</p>		<p>of the denominator using the conjugate.</p> <p>Plot complex numbers on a complex plane</p> <p>Demonstrate the absolute value of a complex number</p>
Skills	<p>Solving Linear equations and Inequalities</p> <p>Graphing Linear Functions</p> <p>Writing Linear Functions</p> <p>Linear Inequalities in two variables</p> <p>Solving Systems of Equations by Graphing</p> <p>Solving Systems of Equations by Substitution</p> <p>Solving Systems of Equations by Elimination</p> <p>Solving System of Linear Inequalities</p> <p>Linear Equations in Three Dimensions</p> <p>Graphing Quadratic Functions</p> <p>Solving Quadratic Functions by Graphing</p> <p>Solving Quadratic Functions by the Square Root Method</p>	<p>Integer Exponents</p> <p>Multiplying Monomials</p> <p>Dividing Monomials</p> <p>Classifying Polynomials</p> <p>Addition and Subtraction of Polynomials</p> <p>Multiplication of Polynomials by a Monomial</p> <p>Division of Polynomials by a Monomial</p> <p>Multiplication of Binomials</p> <p>Multiplication of Polynomials</p> <p>Factoring using Common Factors & Factoring Quadratic Trinomials</p> <p>Factoring – Difference of two squares</p> <p>Solving Quadratic Functions by Factoring</p> <p>Completing the Square</p>	<p>Simplifying Rational Expressions & Multiplying Rational Expressions</p> <p>Dividing Rational Expressions</p> <p>Adding and Subtracting Rational Expressions</p> <p>Solving Rational Equations</p> <p>Graphing Rational Functions</p> <p>Solving Rational Equations</p> <p>Exponential Growth and Decay Functions</p> <p>Graphing Exponential Growth and Decay Functions ; inverse of relations and functions</p> <p>Logarithmic Functions</p> <p>Properties of Logarithms (expand and condense)</p> <p>Solving Exponential and Logarithmic Equations</p> <p>The Natural base e</p>	<p>Properties of Matrices</p> <p>Operations with Matrices (Addition, subtraction, scalar multiplication)</p> <p>Operations with Matrices (multiply 3x3 matrices)</p> <p>Solving systems of equations using matrices</p> <p>Graphing Complex Numbers</p> <p>Operations with Complex Numbers</p> <p>Evaluate Powers of i</p>