

MIDLAND ISD
ADVANCED PLACEMENT CURRICULUM STANDARDS

ALGEBRA II		
TEKS	COLLEGE BOARD	COLLEGE AND CAREER READINESS STDS
<p>(1) Foundations for functions. The student uses properties and attributes of functions and applies functions to problem situations. The student is expected to:</p> <p>(A) identify the mathematical domains and ranges of functions and determine reasonable domain and range values for continuous and discrete situations; and</p> <p>(B) collect and organize data, make and interpret scatterplots, fit the graph of a function to the data, interpret the results, and proceed to model, predict, and make decisions and critical judgments.</p> <p>(2) Foundations for functions. The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. The student is expected to:</p> <p>(A) use tools including factoring and properties of exponents to simplify expressions and to transform and solve equations; and</p> <p>(B) use complex numbers to describe the solutions of quadratic equations.</p>	<p>Standard AII.1: Polynomial Expressions, Functions, and Equations</p> <p>AII.1.1 Student operates with monomials, binomials, and polynomials, applies these operations to analyze the graphical behavior of polynomial functions, and applies the composition of functions to model and solve problems.</p> <p>AII.1.2 Student represents, compares, translates among representations, and graphically, symbolically, and tabularly represents, interprets, and solves problems involving quadratic functions.</p> <p>AII.1.3 Student represents, applies, and discusses the properties of complex numbers.</p> <p>Standard AII.2: Exponential, Logarithmic, and Other Functions</p> <p>AII.2.1 Student represents geometric or exponential growth with exponential functions and equations, and applies such functions and equations to solve problems in mathematics and real-world contexts.</p> <p>AII.2.2 Student defines logarithmic functions and uses them to solve problems in mathematics and real-world contexts.</p> <p>AII.2.3 Student interprets and represents rational and radical functions and solves rational and radical equations.</p>	<p>I. Numeric Reasoning</p> <p>A. Number representation</p> <ol style="list-style-type: none"> 1. Compare real numbers. 2. Define and give examples of complex numbers. <p>B. Number operations</p> <ol style="list-style-type: none"> 1. Perform computations with real and complex numbers. <p>C. Number sense and number concepts</p> <ol style="list-style-type: none"> 1. Use estimation to check for errors and reasonableness of solutions. <p>II. Algebraic Reasoning</p> <p>A. Expressions and equations</p> <ol style="list-style-type: none"> 1. Explain and differentiate between expressions and equations using words such as “solve,” “evaluate,” and “simplify.” <p>B. Manipulating expressions</p> <ol style="list-style-type: none"> 1. Recognize and use algebraic (field) properties concepts, procedures, and algorithms to combine, transform, and evaluate expressions (e.g., polynomials, radicals, rational expressions). <p>C. Solving equations, inequalities, and systems of equations</p> <ol style="list-style-type: none"> 1. Recognize and use algebraic (field) properties concepts, procedures, and algorithms to solve equations, inequalities, and systems of linear equations. 2. Explain the difference between the solution

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<p>(3) Foundations for functions. The student formulates systems of equations and inequalities from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situations. The student is expected to:</p> <p>(A) analyze situations and formulate systems of equations in two or more unknowns or inequalities in two unknowns to solve problems;</p> <p>(B) use algebraic methods, graphs, tables, or matrices, to solve systems of equations or inequalities; and</p> <p>(C) interpret and determine the reasonableness of solutions to systems of equations or inequalities for given contexts.</p> <p>(4) Algebra and geometry. The student connects algebraic and geometric representations of functions. The student is expected to:</p> <p>(A) identify and sketch graphs of parent functions, including linear ($f(x) = x$), quadratic ($f(x) = x^2$), exponential ($f(x) = a^x$), and logarithmic ($f(x) = \log_a x$) functions, absolute value of x ($f(x) = x$), square root of x ($f(x) = \sqrt{x}$), and reciprocal of x ($f(x) = 1/x$);</p> <p>(B) extend parent functions with parameters</p>	<p>All.2.4 Student interprets and models step and other piecewise-defined functions, including functions involving absolute value.</p> <p>Standard All.3: Systems of Equations and Inequalities and Matrices</p> <p>All.3.1 Student constructs, solves, and interprets solutions of systems of linear equations in two variables representing mathematical and real-world contexts.</p> <p>All.3.2 Student represents and interprets cross-categorized data in matrices, develops properties of matrix addition, and uses matrix addition and its properties to solve problems.</p> <p>All.3.3 Student multiplies matrices, verifies the properties of matrix multiplication, and uses the matrix form for a system of linear equations to structure and solve systems consisting of two or three linear equations in two or three unknowns, respectively, with technology.</p> <p>Standard All.4: Experiments, Surveys, and Observational Studies</p> <p>All.4.1 Student identifies problems that can be addressed through collection and analysis of experimental data, designs and implements simple comparative experiments, and draws appropriate</p>	<p>set of an equation and the solution set of an inequality.</p> <p>D. Representations</p> <ol style="list-style-type: none"> 1. Interpret multiple representations of equations and relationships. 2. Translate among multiple representations of equations and relationships. <p>III. Geometric Reasoning</p> <p>A. Figures and their properties</p> <ol style="list-style-type: none"> 1. Identify and represent the features of plane and space figures. 2. Make, test, and use conjectures about one-, two-, and three-dimensional figures and their properties. 3. Recognize and apply right triangle relationships including basic trigonometry. <p>B. Transformations and symmetry</p> <ol style="list-style-type: none"> 1. Identify and apply transformations to figures. 2. Identify the symmetries of a plane figure. 3. Use congruence transformations and dilations to investigate congruence, similarity, and symmetries of plane figures. <p>C. Connections between geometry and other mathematical content strands</p> <ol style="list-style-type: none"> 1. Make connections between geometry and algebra. 2. Make connections between geometry, statistics, and probability. 	

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<p>such as a in $f(x) = a/x$ and describe the effects of the parameter changes on the graph of parent functions; and</p> <p>(C) describe and analyze the relationship between a function and its inverse.</p> <p>(5) Algebra and geometry. The student knows the relationship between the geometric and algebraic descriptions of conic sections. The student is expected to:</p> <p>(A) describe a conic section as the intersection of a plane and a cone;</p> <p>(B) sketch graphs of conic sections to relate simple parameter changes in the equation to corresponding changes in the graph;</p> <p>(C) identify symmetries from graphs of conic sections;</p> <p>(D) identify the conic section from a given equation; and</p> <p>(E) use the method of completing the square.</p> <p>(6) Quadratic and square root functions. The student understands that quadratic functions can be represented in different ways and translates among their various representations. The student is expected to:</p> <p>(A) determine the reasonable domain and range values of quadratic functions, as well as interpret and determine the reasonableness of solutions to quadratic equations and</p>	<p>conclusions from the collected data.</p> <p>All.4.2 Student distinguishes among surveys, observational studies, and designed experiments and relates each type of investigation to the research questions it is best suited to address. Student recognizes that an observed association between a response variable and an explanatory variable does not necessarily imply that the two variables are causally linked. Student recognizes the importance of random selection in surveys and random assignment in experimental studies. Student communicates the purposes, methods, and results of a statistical study, and evaluates studies reported in the media.</p> <p>Standard All.5 Permutations, Combinations, and Probability Distributions</p> <p>All.5.1 Student solves ordering, counting, and related probability problems. Student recognizes a binomial probability setting and computes the probability distribution for a binomial count.</p> <p>All.5.2 Student identifies data settings in which the normal distribution may be useful. Student describes characteristics of the normal distribution and uses the empirical rule to solve problems.</p>	<p>3. Make connections between geometry and measurement.</p> <p>D. Logic and reasoning in geometry</p> <p>1. Make and validate geometric conjectures.</p> <p>2. Understand that Euclidean geometry is an axiomatic system.</p> <p>IV. Measurement Reasoning</p> <p>A. Measurement involving physical and natural attributes</p> <p>1. Select or use the appropriate type of unit for the attribute being measured.</p> <p>B. Systems of measurement</p> <p>1. Convert from one measurement system to another.</p> <p>2. Convert within a single measurement system.</p> <p>C. Measurement involving geometry and algebra</p> <p>1. Find the perimeter and area of two-dimensional figures.</p> <p>2. Determine the surface area and volume of three-dimensional figures.</p> <p>3. Determine indirect measurements of figures using scale drawings, similar figures, the Pythagorean Theorem, and basic trigonometry.</p> <p>D. Measurement involving statistics and probability</p> <p>1. Compute and use measures of center and spread to describe data.</p> <p>2. Apply probabilistic measures to practical</p>

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<p>inequalities; (B) relate representations of quadratic functions, such as algebraic, tabular, graphical, and verbal descriptions; and (C) determine a quadratic function from its roots (real and complex) or a graph.</p> <p>(7) Quadratic and square root functions. The student interprets and describes the effects of changes in the parameters of quadratic functions in applied and mathematical situations. The student is expected to: (A) use characteristics of the quadratic parent function to sketch the related graphs and connect between the $y = ax^2 + bx + c$ and the $y = a(x - h)^2 + k$ symbolic representations of quadratic functions; and (B) use the parent function to investigate, describe, and predict the effects of changes in a, h, and k on the graphs of $y = a(x - h)^2 + k$ form of a function in applied and purely mathematical situations.</p> <p>(8) Quadratic and square root functions. The student formulates equations and inequalities based on quadratic functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. The student is expected to: (A) analyze situations involving quadratic</p>		<p>situations to make an informed decision.</p> <p>V. Probabilistic Reasoning A. Counting principles 1. Determine the nature and the number of elements in a finite sample space. B. Computation and interpretation of probabilities 1. Compute and interpret the probability of an event and its complement. 2. Compute and interpret the probability of conditional and compound events.</p> <p>VI. Statistical Reasoning A. Data collection 1. Plan a study. B. Describe data 1. Determine types of data. 2. Select and apply appropriate visual representations of data. 3. Compute and describe summary statistics of data. 4. Describe patterns and departure from patterns in a set of data. C. Read, analyze, interpret, and draw conclusions from data 1. Make predictions and draw inferences using summary statistics. 2. Analyze data sets using graphs and summary statistics.</p>

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ADVANCED PLACEMENT CURRICULUM STANDARDS**

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<p>functions and formulate quadratic equations or inequalities to solve problems; (B) analyze and interpret the solutions of quadratic equations using discriminants and solve quadratic equations using the quadratic formula; (C) compare and translate between algebraic and graphical solutions of quadratic equations; and (D) solve quadratic equations and inequalities using graphs, tables, and algebraic methods.</p> <p>(9) Quadratic and square root functions. The student formulates equations and inequalities based on square root functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. The student is expected to:</p> <p>(A) use the parent function to investigate, describe, and predict the effects of parameter changes on the graphs of square root functions and describe limitations on the domains and ranges; (B) relate representations of square root functions, such as algebraic, tabular, graphical, and verbal descriptions; (C) determine the reasonable domain and range values of square root functions, as well as interpret and determine the reasonableness of solutions to square root equations and</p>		<p>3. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software. 4. Recognize reliability of statistical results.</p> <p>VII. Functions A. Recognition and representation of functions 1. Recognize whether a relation is a function. 2. Recognize and distinguish between different types of functions. B. Analysis of functions 1. Understand and analyze features of a function. 2. Algebraically construct and analyze new functions. C. Model real world situations with functions 1. Apply known function models. 2. Develop a function to model a situation.</p> <p>VIII. Problem Solving and Reasoning A. Mathematical problem solving 1. Analyze given information. 2. Formulate a plan or strategy. 3. Determine a solution. 4. Justify the solution. 5. Evaluate the problem-solving process. B. Logical reasoning 1. Develop and evaluate convincing arguments. 2. Use various types of reasoning.</p>

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<p>inequalities; (D) determine solutions of square root equations using graphs, tables, and algebraic methods; (E) determine solutions of square root inequalities using graphs and tables; (F) analyze situations modeled by square root functions, formulate equations or inequalities, select a method, and solve problems; and (G) connect inverses of square root functions with quadratic functions.</p> <p>(10) Rational functions. The student formulates equations and inequalities based on rational functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. The student is expected to: (A) use quotients of polynomials to describe the graphs of rational functions, predict the effects of parameter changes, describe limitations on the domains and ranges, and examine asymptotic behavior; (B) analyze various representations of rational functions with respect to problem situations; (C) determine the reasonable domain and range values of rational functions, as well as interpret and determine the reasonableness of solutions to rational equations and inequalities; (D) determine the solutions of rational</p>		<p>C. Real world problem solving 1. Formulate a solution to a real world situation based on the solution to a mathematical problem. 2. Use a function to model a real world situation. 3. Evaluate the problem-solving process.</p> <p>IX. Communication and Representation A. Language, terms, and symbols of mathematics 1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem. 2. Use mathematical language to represent and communicate the mathematical concepts in a problem. 3. Use mathematics as a language for reasoning, problem solving, making connections, and generalizing. B. Interpretation of mathematical work 1. Model and interpret mathematical ideas and concepts using multiple representations. 2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. C. Presentation and representation of mathematical work 1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams,</p>

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<p>equations using graphs, tables, and algebraic methods;</p> <p>(E) determine solutions of rational inequalities using graphs and tables;</p> <p>(F) analyze a situation modeled by a rational function, formulate an equation or inequality composed of a linear or quadratic function, and solve the problem; and</p> <p>(G) use functions to model and make predictions in problem situations involving direct and inverse variation.</p> <p>(11) Exponential and logarithmic functions. The student formulates equations and inequalities based on exponential and logarithmic functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation. The student is expected to:</p> <p>(A) develop the definition of logarithms by exploring and describing the relationship between exponential functions and their inverses;</p> <p>(B) use the parent functions to investigate, describe, and predict the effects of parameter changes on the graphs of exponential and logarithmic functions, describe limitations on the domains and ranges, and examine asymptotic behavior;</p> <p>(C) determine the reasonable domain and</p>		<p>graphs, and words.</p> <p>2. Create and use representations to organize, record, and communicate mathematical ideas.</p> <p>3. Explain, display or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.</p> <p>X. Connections</p> <p>A. Connections among the strands of mathematics</p> <p>1. Connect and use multiple strands of mathematics in situations and problems.</p> <p>2. Connect mathematics to the study of other disciplines.</p> <p>B. Connections of mathematics to nature, real world situations, and everyday life</p> <p>1. Use multiple representations to demonstrate links between mathematical and real world situations.</p> <p>2. Understand and use appropriate mathematical models in the natural, physical, and social sciences.</p> <p>3. Know and understand the use of mathematics in a variety of careers and professions.</p>

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	ALGEBRA II	
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<p>range values of exponential and logarithmic functions, as well as interpret and determine the reasonableness of solutions to exponential and logarithmic equations and inequalities; (D) determine solutions of exponential and logarithmic equations using graphs, tables, and algebraic methods; (E) determine solutions of exponential and logarithmic inequalities using graphs and tables; and (F) analyze a situation modeled by an exponential function, formulate an equation or inequality, and solve the problem.</p>		