	Hawaiʻi Algebra II End-of-Course Exam Performance Level Descriptors
Well Below Proficiency	A student performing at the Well Below Proficiency level may demonstrate the following: • Identify the difference between integer and rational exponents; rewrite expressions with rational exponents of the form 1/n to radical form and vice versa; recognize appropriate units for the solution of multi-step problems. • Identify parts of an expression; factor and complete the square of a quadratic expression with leading coefficient of 1; use properties of exponents to expand a single variable with a positive integer exponent into an equivalent form; perform addition, subtraction, and multiplication on monomials; identify the zeros of factored polynomials; identify rational and radical equations; recognize equivalent forms of quadratic equations; solve quadratic equations by factoring; identify the point(s) of intersection for two graphed functions as the solutions. • Identify graphs of functions (linear, quadratic and absolute value); identify the zeros of a quadratic function on a graph; identify a function as exponential; identify a logarithmic equation; recognize the inverse of a function based on values in a table. • identify equations in one or more variables to represent relationships between quantities; interpret simple expressions in context; identify some key features of graphs and tables in context; identify an appropriate domain of a function in context; identify the type of function used for a context; combine functions and constants using arithmetic operations; identify functions as linear or exponential from their graphs, descriptions, and input-output pairs; represent data on two quantitative variables on a scatter plot; identify the type of linear trend for the data of a scatter plot.
Approaches Proficiency	A student performing at the Approaches Proficiency level demonstrates the following: • Apply the definition of the meaning of rational exponents to extend the properties of integer exponents to those values; rewrite expressions with rational exponents extending the properties of exponents; choose appropriate units for the solution of multi-step problems; identify a complex number; perform simple addition, subtraction and multiplication with complex numbers; recognize complex solutions for quadratic equations. • Approximate solutions using graphing technology; use the structure of an expression to identify ways to rewrite and/or solve simple equations resulting in real and complex solutions (including factoring, completing the square, using the quadratic formula, using polynomial identities, and using properties of exponents); identify zeros of factored polynomials and use the zeros to construct a rough graph; recognize the discriminant of the quadratic formula; perform operations on polynomial expressions of degree 2 or less; recognize different forms of simple rational expressions are equivalent; solve simple rational and radical equations in one variable without extraneous solutions; identify the x-coordinates of the intersection points of the graphs of any two functions are the solutions; recognize the Binomial Theorem. • Identify functions (linear, quadratic, polynomial, rational, exponential, logarithmic, square root, cube root, piecewise-defined, step, absolute value) to show intercepts, maxima and minima, extreme values, asymptotes, symmetry, end behavior, and intervals where the function is positive or negative, using technology where appropriate; identify some properties of exponents to interpret expressions for exponential functions and classify as growth or decay; evaluate a logarithm using technology; rewrite logarithms as exponential functions, and vice versa; recognize some properties of two functions each represented algebraically, graphically, numerically in tables, or by verbal descriptions; observe using graphs that a quantity increasing exponentially eventually exceeds a quantity increasing as a polynomial function; identify the effect on a graph by replacing $f(x)$ with $f(x)+k$ and $f(x+k)$;

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	identify whether or not a function has an inverse; read values of an inverse function from a table; • Identify appropriate quantities for the purpose of descriptive modeling; create inequalities in one variable; create equations in one or more variables to represent relationships between quantities; recognize linear and exponential functions given a graph; write a linear function that describes a relationship between two quantities using composition; identify an explicit expression for calculation from a context; identify parts of complicated expressions and statements that use function notation in terms of a context; identify some parameters in a linear, quadratic or exponential function in terms of a context and how they relate the domain (or reasonable domain) of a function to its graph and key features of graphs and tables; sketch graphs showing some key features given a verbal description of the relationship; identify constant rate of change from the graph of a function; identify exponential functions by examining their rate of change in context; identify a linear, quadratic or exponential function to a set of data and describe how the variables are related; identify either the slope or the y-intercept of a linear function for a scatter plot that suggests a linear association.
Meets Proficiency	A student performing at the Meets Proficiency level demonstrates the following: • Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values; rewrite expressions involving radicals and rational exponents using all properties of exponents; apply appropriate units to guide the solution of multi-step problems and choose appropriate scale in graphs and data displays; perform addition, subtraction and multiplication with all complex numbers; solve quadratic equations that have complex solutions. • Use the structure of an expression to identify ways to rewrite and/or solve equations resulting in real and complex solutions (including factoring, completing the square, using the quadratic formula, using polynomial identities, and using properties of exponents); identify zeros of factorable polynomials and use the zeros to construct a rough graph; recognize when the quadratic formula gives complex solutions; perform operations on polynomials and rational expressions; solve simple rational and radical equations in one variable with extraneous solutions; explain why the x-coordinates of the intersection points of the graphs of any two functions are the solutions, approximate solutions, use technology, tables of values, or finding successive approximations; use the Binomial Theorem. • Graph functions (linear, quadratic, polynomial, rational, exponential, logarithmic, square root, cube root, piecewise-defined, step, absolute value) to show intercepts, maxima and minima, extreme values, asymptotes, symmetry, end behavior, and intervals where the function is positive or negative, using technology where appropriate; uses properties of exponents to interpret expressions for exponential functions and classify as growth or decay; express as a logarithm the solution to an exponential equation with a variable in the exponent; solve problems involving logarithms and exponents; compare properties of two functions each represented algebraically, graphically, numerically in tables, or by verbal descriptions; observe using tables and graphs that a quantity increasing exponentially eventually exceeds a quantity increasing as a polynomial function; identify the effect on a graph by replacing f(x) with f(x)+k, kf(x), f(kx) and f(x+k); determine an inverse of a simple function; use composition to verify inverse functions; read values of an inverse function from a graph or table; create an invertible function by restricting the domain of a non-invertible function. • Define appropriate quantities for the purpose of descriptive modeling; create equations and inequalities in one variable and use them to solve problems; create

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	equations in two or more variables to represent relationships between quantities, graph equations on coordinate axes with labels and scales; construct linear and exponential functions given a graph; write a function that describes a relationship between two quantities using composition; determine an explicit expression, a recursive process, or steps for calculation from a context; interpret complicated expressions and statements that use function notation in terms of a context; interpret parameters in a linear, quadratic or exponential function in terms of a context and how they relate the domain (or reasonable domain) of a function to its graph and key features of graphs and tables, and sketch graphs showing key features given a verbal description of the relationship; recognize situations in which one quantity changes at a constant rate per unit interval relative to another; recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another; fit a linear, quadratic or exponential function to a set of data, use functions fitted to data to solve problems in the context; informally assess the fit of a function by plotting and analyzing residuals.
Exceeds Proficiency	A student performing at the Exceeds Proficiency level demonstrates the following: • Identify the property used when rewriting expressions involving radicals and rational exponents; interpret units in multi-step problems; applies the standard form of a complex number, a+bi, to solve problems; explain the properties used to perform addition, subtraction and multiplication with all complex numbers; explain the steps used to solve quadratic equations that have complex solutions. • Make generalizations about equivalent forms of equations with real and complex solutions (including factoring, completing the square, using the quadratic formula, using polynomial identities, and using properties of exponents); create the formula from the graph to represent the polynomial; apply and analyze solutions to quadratic equations in a real world context; explain that polynomials are closed under addition, subtraction and multiplication, but not under division; explain that rational functions are closed under addition, subtraction, multiplication and division; solve all rational and radical equations in one variable and explain extraneous solutions; make generalizations about how to derive the solution set of two functions; approximate solutions, use technology, tables of values, or finding successive approximations; apply and prove the Binomial Theorem. • Analyze the behavior of the graph of functions (linear, quadratic, polynomial, rational, exponential, logarithmic, square root, cube root, piecewise-defined, step, absolute value) to show intercepts, maxima and minima, extreme values, asymptotes, symmetry, end behavior, and intervals where the function is positive or negative, using technology where appropriate, in mathematical and real-world contexts; use real-world applications of exponential growth and decay functions and analyze their solutions in the context of the situation; use logarithms to solve an exponential equation with a variable in the exponent; analyze properties of two functions each represented algebraically, graphically, numerically in tables, or by verbal descriptions; make generalizations about the intersections of polynomial and exponential functions that occur beyond the boundaries of the visible graph; create a function by replacing $f(x)$ with $f(x)+k$, $kf(x)$, $f(kx)$ and $f(x+k)$ from a graph or verbal description; determine an inverse of a complex function; analyze inverse functions through composition and graphing. • Define and evaluate appropriate quantities for the purpose of descriptive modeling; evaluate equations and inequalities in one variable and use them to solve complex problems in context; create and explain all components of equations in two or more variables to represent relationships between quantities and relate its graph to the equation; construct linear and exponential functions given a verbal description; use

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	composition to create functions to model real-world contexts; explain how an explicit expression, a recursive process, or steps for calculation defines a context; justify complicated expressions and statements that use function notation in terms of a context; extract generalizations about parameters in a linear, quadratic or exponential function in terms of a context and how they relate the domain (or reasonable domain) of a function to its graph and key features of graphs and tables, and sketch graphs showing key features given a verbal description of the relationship; apply knowledge of rate of change in linear or exponential functions to real-world contexts; fit a linear, quadratic or exponential function to a set of data, use functions fitted to data to solve problems in the context, and explain how a change in the context can affect the function; analyze fit of functions and use residual graphs to compare fits of different functions.