College Algebra
Linear Functions & Systems

Competencies

HS 2.1, HS 2.2, HS 3.1, HS 4.2

Resources

College Alegra Textbook

Standards

A.SSE.1 - Interpret expressions that represent a quantity in terms of its context.
A.SSE.2 - Use the structure of an expression to identify ways to rewrite it.
A.SSE.3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.CED.3 - Represent constraints by equations or inequalities, and by systems of equations and'or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
A.REI.2 - Apply and extend previous understanding to solve equations, inequalities, and compound inequalities in one variable, including literal equations and inequalities.
A.REI.6 - Analyze and solve pairs of simultaneous linear equations.
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
A.REI.10 - Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solutions set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
F.IF.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, the f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.
F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.8 - Write a function in different but equivalent forms to reveal and explain different properties of the function
F.BF.1 - Use functions to model real-world relationships
G.GPE.7 - Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g. find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Vocab

Content: Slope rate of change point-slope form slope-intercept form standard form y-intercept x-intercept vertical line horizontal line linear function coordinate plane ordered pair parallel slope perpendicular slope parallel equation perpendicular equation inverse relationship reciprocal solve system of linear equations substitution elimination inequality system of inequalities solution of an inequality half plane linear programming objective function constraints vertex solution set interval notation inequality notation
Academic: identify describe write apply solve graph interpret

College Algebra
Linear Functions & Systems

I can

* I can write a linear function from a description, table, or graph (including horizontal and vertical lines).

* I can write a linear function in slope-intercept, point, slope, and standard form.

* I can graph a linear function by hand and using the graphing calculator (Including horizontal and vertical lines).

* I can identify key features of a linear function, including slope, x-intercepts, and y-intercepts.

* I can find parallel and perpendicular slopes.

* I can write parallel and perpendicular equations.

* I can solve linear equations, including multi-step and fractions.

* I can solve linear inequalities and represent their solutions as an inequality, interval notation and on a number line.

* I can solve systems of linear equations by graphing, substitution, or elimination.

* I can graph linear inequalities

* I can graph systems of linear equations and inequalities.

* I can solve linear programming problems.

College Algebra
Radical & Rational Exponent Functions

Competencies

HS 2.2, HS 3.1

Resources

College Alegra Textbook

Standards

N.RN.3 - Rewrite expressions involving radicals and rational exponents using the properties of exponents.

A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.REI.2 - Apply and extend previous understanding to solve equations.

A.REI.4 - Solve radical and rational exponent equations and inequalities in one variable and give examples showing how extraneous solutions may arise.

A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).

A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

F.IF.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, the f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.

F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Vocab

Content: radical rational exponent square root cube root perfect squares/cubes rationalize the denominator complex radical even power odd power domain range extraneous solution
Academic: simplify evaluate solve graph transform interpret analyze estimate

College Algebra
Radical & Rational Exponent Functions

I can

* I can simplify radicals; specifically square roots and cube roots.

* I can estimate the decimal value of a square root and cube root.

* I can add, subtract, and multiply radicals.

* I can rationalize the denominator given a single radical or complex radical.

* I can convert radicals and rational exponents and evaluate.

* I can graph radical functions.

* I can graph rational exponent functions.

* I can identify key features of radical and rational exponent functions: including domain, range, even/odd features.

* I can solve radical equations and state extraneous solutions when they arise.

* I can solve rational exponent equations and state extraneous solutions when they arise.

* I can solve radical and rational exponent equations by hand and by graphing.

College Algebra
Quadratic & Absolute Value Functions

Competencies

HS 2.2, HS 3.1, HS 2.1

Resources

College Alegra Textbook

Standards

N.CN.8 - Solve quadratic equations with real coefficients that have complex solutions.
A.SSE.2 - Use the structure of an expression to identify ways to rewrite it.
A.SSE.3a - Factor a quadratic expression to reveal the zeros of the function it defines.
A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.REI.2 - Apply and extend previous understanding to solve equations, inequalities, and compound inequalities in one variable, including literal equations and inequalities.
A.REI.5 - Solve quadratic equations and inequalities
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.IF.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, the f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.
F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.8 - Write a function in different but equivalent forms to reveal and explain different properties of the function

Vocab

Content: quadratic function vertex form standard form factored form vertex leading coefficient domain range zeros extrema end behavior binomial factors greatest common factor monomial binomial trinomial imaginary number complex number quadratic inequality solution set interval notation inequality notation absolute value
Academic: simplify evaluate rewrite graph solve interpret analyze

College Algebra
Quadratic & Absolute Value Functions

I can

* I can graph quadratic functions by hand and by graphing.

* I can graph absolute value equations by hand and by graphing.

* can identify key features from a graph; specifically domain, range, zeros, extrema(vertex), and end behavior.

* I can write a quadratic equation from a description, table, or graph.

* I can write quadratic equations in standard form, vertex form, and factored form.

* I can rewrite quadratic equations to identify key features of the function: specifically end beavhior, zeros, and vertex.

* I can solve quadration equations using factoring, square roots, quadratic formula, or graphing.

* I can find real and imaginary solutions of a quadratic equation.

* I can solve quadratic inequalities by hand and by graphing.

* I can solve absolute value equations by hand and by graphing.

* I can solve absolute value inequalities by hand and by graphing.

* I can represent the solution set of an inequality using interval notation and on a number line.

College Algebra
Piecewise Functions & Transformations

Competencies

HS 3.1, HS 2.1

Resources

College Alegra Textbook

Standards

A.SSE.1 - Interpret expressions that represent a quantity in terms of its context.

F.IF.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, the f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

F.IF.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.

F.IF.5 - Reate the domain of a function to its graph and, where applicable to the quantitative relationship it describes.

F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

F.BF.3 - Transform parent functions f(x) by replacing f(x) with f(x) + k, kf(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Vocab

Content: transformation translations horizontal shift vertical shift reflection vertical dilation horizontal dilation symmetry parent function transformed function piecewise function domain evaluate
Academic: read state identify evaluate interpret write graph

College Algebra
Piecewise Functions & Transformations

I can

** I can read piecewise functions.

* I can state the domain of a piecewise function.

* I can evaluate a piecewise functions using function notation from its equation and graph.

* I can graph a piecewise function.

* I can evaluate and graph a step-function.

* I can write a piecewise function from a description or graph

* I can identify transformations on the parent functions: radical, rational exponent, absolute value, quadratic.

* I can write a transformation function given a description and parent function.

* I can write a transformation function given its graph.

* I can graph transformations on a parent function.

College Algebra
Polynomial Functions

Competencies

HS 3.1, HS 2.1, HS 2.2

Resources

College Alegra Textbook

Standards

N.CN.8 - Solve quadratic equations with real coefficients that have complex solutions.
N.CN.9 - Extend polynomial identities to the complex numbers. For example, rewrite x^2 + 4 as (x+2i)(x-2i)
N.CN.10 - Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
A.SSE.2 - Use the structure of an expression to identify ways to rewrite it.
A.SSE.3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.APR.2 - Factor higher degree polynomials; identifying that some polynomials are prime.
A.APR.3 - Know and apply the Remainder Theorem: For a polynomial p(x) and a number c, the remainder on division by (x-c) is p(c) = 0 if and only if (x-c) is a factor of p(x).
A.APR.4 - Generate polynomial identities from a pattern.
A.APR.6 - Rewrite simple rational expressions in different forms; write a(x) / b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(b), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or for the more complicates examples, a computer algebra system.
A.CED.1 - Apply and extend previous understanding to create equations and inequalities in one variable and use them to solve problems.
A.REI.2 - Apply and extend previous understanding to solve equations, inequalities, and compound inequalities in one variable, including literal equations and inequalities
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.
F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.8 - Write a function in different but equivalent forms to reveal and explain different properties of the function

Vocab

Content: polynomial quadratic cubic quartic zeros degree terms factors leading coefficient multiplicity linear factors factored form standard form domain range zeros extrema intervals of increase/decrease intervals above and below zero end behavior long division synthetic division quotient remainder dividend divisor Remainder theorem zero-factor theorem fundamental theorem of algebra factoring square root quadratic formula interval notation inequality notation
Academic: identify analyze graph rewrite solve interpret apply

College Algebra
Polynomial Functions

I can

* I can graph polynomial functions using the graphing calculator.

* I can identify key features from a graph; specifically domain, range, zeros, extrema(vertex), and intervals of increase/decrease, intervals above and below f(x) = 0, and end behavior.

* I can write a polynomial equation in linear form given its degree, zeros, and point or graph.

* I can write a polynomial equation in standard form given its degree, zeros, and point or graph.

* I can identify key features of the polynomial function using the leading coefficient test and multiplicity; specifically to identify end behavior and zeros with multiplicity.

* I can divide polynomials using long division.

* I can divide polynomials using synthetic division.

* I can solve higher degree polynomial equations by factoring.

* I can solve higher degree polynomials by graphing, synthetic division, and solving techniques of quadratic equations.

* I can solve simple polynomial inequalities by graphing and solving techniques.

College Algebra
Rational Functions

Competencies

HS 3.1, HS 2.1, HS 2.2

Resources

College Alegra Textbook

Standards

A.SSE.2 - Use the structure of an expression to identify ways to rewrite it.
A.SSE.3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.APR.7 - Add, subtract, multiply, and divide rational expressions.
A.CED.1 - Apply and extend previous understanding to create equations and inequalities in one variable and use them to solve problems.
A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.REI.2 - Apply and extend previous understanding to solve equations, inequalities, and compound inequalities in one variable, including literal equations and inequalities.
A.REI.3 - Solve equations in one variable and given examples showing how extraneous solutions may arise.
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.
F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.7f - Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
F.IF.8 - Write a function in different but equivalent forms to reveal and explain different properties of the function

Vocab

Content: rational expression simplify factored form common denominator multiply by reciprocal domain restrictions complex fractions extraneous solution hole vertical asymptote horizontal asymptote domain range x/y-intercepts end behavior asymptote behavior
Academic:

College Algebra
Rational Functions

I can

* I can find the domain of rational expressions and state domain restrictions.

* I can simplify a rational expression.

* I can add and subtract rational expressions.

* I can multiply and divide rational expressions.

* I can solve a rational equation and state extraneous solutions.

* I can graph a rational function.

* I can identify key features of a rational function by hand and using a graph: specifically domain, range, asymptotes, intercepts, and end behavior.

College Algebra
Combinations, Composites, & Inverse Functions

Competencies

HS 3.1, HS 2.1, HS 2.2

Resources

College Alegra Textbook

Standards

A.SSE.2 - Use the structure of an expression to identify ways to rewrite it
A.APR.1 - Add, subtract, and multiply polynomials.
A.CED.1 - Apply and extend previous understanding to create equations in one variable
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.IF.1 - Understand that a function from one set (called the domain) to angother set (called the range) assigns to each element of the domain exactly on e element of the range. If f is a function and x is an element of its domain, the f(x) denotes the ouput of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
F.IF.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F.BF.1 - Use functions to model real-world relationships.
F.BF.1c - Compose functions.
F.BF.4 - Find inverse functions.
F.BF.4a - Write an expression for the inverse of a function.
F.BF.4b - Read values of an inverse function from a graph or a table, given that the function has an inverse.
F.BF.4c - Verify by compsotion that one function is the inverse of another.
F.BF.4d - Produce an invertible function from a non-intertible function by restriting the domain.

Vocab

Content: function domain domain restrictions function notation combination functions composite function inverse inverse relationship inverse properties inverse function vertical line test horizontal line test one-to-one function inverse equation proof
Academic: create recognize apply evaluate identify write prove

College Algebra

Combinations, Composites, & Inverse Functions

I can

* I can find the domain of a function and state restrictions.

* I can recognize and apply function notation.

* I can combine functions using addition, subtract, multiplication, division.

* I can compose functions.

* I can evaluate combinations and composites using equations, tables, and graphs.

* I can state the domain of a combination or composite function.

* I can identify inverse relationships using a description, input/output chart, table, or graph.

* I can identify the domain and range of a function and its inverse.

* I can identify invertible functions.

* I can restrict the domain of a non-invertible function to create an invertible function.

* I can find the equation of a inverse function.

* I can graph a function and its inverse.

* I can prove two functions are inverses using composites.

College Algebra
Exponential & Logarithmic Functions

Competencies

HS 3.1, HS 2.1, HS 2.2

Resources

College Alegra Textbook

Standards

N.RN.1 - Know and apply the properties of integer exponents to generate equivalent numberical and algebraic expressions
A.SSE.1 - Interpret expressions that represent a quantity in terms of its context.
A.SSE.2 - Use the structure of an expression to identify ways to rewrite it.
A.CED.2 - Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.REI.2 - Apply and extend previous understanding to solve equations, inequalities, and compound inequalities in one variable, including literal equations and inequalities.
A.REI.3 - Solve equations in one variable and give examples showing how extraneous oslutions may arise.
A. REI.3b - Solve exponential and logarithmic equations.
A.REI.8 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane often forming a curve (which could be a line).
A.REI.9 - Solve an equation f(x)=g(x) by graphing y=f(x) and y=g(x) and finding the x-value of the intersection point. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.IF.4 - For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicty.
F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.7b - Graph exponential functions.
F.IF.7c - Graph logarithmic functions, emphasizing the inverse relationship with exponentials and showing intercepts and end behavior.
F.BF.5 - Understad the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
F.LQE.1 - Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.LQE.2 - Construct exponential functions, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

Vocab

Content: linear model eponential model exponential function base common base natural base power/exponent logarithmic function common log natural log inverse relationship domain range asymptote transformations x/y-intercepts end behavior exponent properties log properties condense expand logs evaluate logs regression models data set model
Academic: compare create interpret analyze convert evaluate solve graph apply model

College Algebra
Exponential & Logarithmic Functions

I can

* I can distinguish between linear and exponential models.

* I can evaluate exponential functions for any base, including common and natural base.

* I can create an exponnential function to model a given situation.

* I can graph exponential functions.

* I can identify key features of the graph; including domain, range, transformations, asymptotes, x/y-intercepts, and end behavior.

* I can use the inverse relationship between exponential and logarithmic expressions to convert.

* I can evaluate exponential expressions using properties.

* I can simplify, condense, and evaluate logs using properties.

* I can graph logarithms using its inverse relationship and independently using transformations and its base.

* I can solve applications problems.

* I can create a linear or exponential regression line to model a data set.