Algebra 2 Course Outline

I. Basic Computation and Symbolic Manipulations

A. Real arithmetic with the proper order of operations
B. Translate verbal to algebraic expressions
C. Evaluate algebraic expressions
D. Simplify expressions using the distributive property and by combining like terms

II. Linear Equations and Inequalities

A. Solve multi-step linear equations
B. Solve formulas for specified variables
C. Solve and graph one-variable multi-step linear inequalities
D. Solve and graph compound linear inequalities
E. Solve absolute value equations
F. Solve and graph absolute value inequalities

III. Two-Dimensional Linear Equations

A. Graph linear equations
B. Find the equation of a line given its slope and a point or two points
C. Find equations of lines parallel or perpendicular to given ones
D. Make a scatterplot of data and find a reasonable best-fit equation

IV. Systems of Equations and Inequalities

A. Solve two-variable linear systems by graphing
B. Solve two-variable linear systems algebraically
C. Solve three-variable linear systems algebraically
D. Graph linear inequalities and find the coordinates of vertices algebraically
E. Solve linear programming problems

V. Matrix Operations

A. Add, subtract, and perform scalar multiplication on matrices
B. Multiply matrices
C. Calculate determinants of square matrices
D. Solve two- and three-variable systems of linear equations using Cramer's rule
E. Calculate the inverse of a 2X2 matrix
F. Calculate the inverse of a 3X3 matrix
G. Solve two- and three-variable systems using matrix inverses

VI. Basic Polynomial Operations

A. Simplify expressions involving products, quotients, and powers of monomials
B. Add, subtract, and multiply polynomials
C. Factor polynomials

D. Solve polynomial equations using factoring

VII. Rational Expressions and Equations

A. Simplify, multiply, and divide rational expressions
B. Add and subtract rational expressions
C. Divide polynomials
D. Simplify complex rational expressions
E. Solve rational equations

VIII. Radical Expressions and Equations

A. Simplify and multiplying radicals
B. Add and subtract radicals
C. Divide and rationalize radicals
D. Convert between radicals and rational exponents
E. Simplify radical expressions using rational exponents
F. Solve radical equations

IX. Complex Numbers

A. Express square roots with negative radicands in terms of complex numbers
B. Calculate powers of the imaginary unit
C. Multiply, add, and subtract complex numbers
D. Divide and rationalize complex numbers
E. Graph complex numbers
F. Find the modulus of a complex number

X. Functions and Transformations

A. Identify functions from relations (table or graph)
B. Identify the domain and range of a function from its graph
C. Evaluate functions given in function notation
D. Graph a function by making a table of values
E. Evaluate function compositions and find general expressions for function compositions
F. Graph the translation of a function
G. Graph the dilation of a function

XI. Quadratic Functions

A. Identify the direction of opening, vertex, and axis of symmetry of a quadratic function given in vertex form
B. Convert between vertex and standard form quadratic functions
C. Find the roots of a quadratic function by factoring, completing the square, or by using the quadratic formula

D. Identify the focus, directrix, and latus rectum of a quadratic function and sketch its graph
E. Analyze parabolas that open horizontally

XII. Conic Sections

A. Identify the center and radius of a circle in standard form and sketch its graph
B. Complete the square to obtain the equation of a circle in standard form
C. Identify the center, orientation, vertices, and foci of an ellipse in standard form and sketch its graph
D. Complete the square to obtain the equation of an ellipse in standard form
E. Identify the center, orientation, vertices, foci, and asymptotes of a hyperbola in standard form and sketch its graph
F. Complete the square to obtain the equation of a hyperbola in standard form
G. Classify a general second-degree equation as a conic section

XIII. Polynomial Root-Finding

A. Identify the end behavior and maximum number of extrema of the graph of a polynomial function
B. Find the roots of a polynomial given one real root
C. Use the rational root theorem to make a list of the possible rational roots of a polynomial, and use synthetic division, factoring, and the quadratic formula to find all of its roots and factors
D. Use Descartes' rule of signs to list the possible combinations of positive, negative, and complex roots a polynomial may have

XIV. Exponential and Logarithmic Functions

A. Distinguish between the graphs of exponential and polynomial functions
B. Calculate the inverse of a function analytically
C. Sketch the graph of the inverse of a function given its original graph
D. Explain what a logarithm function is
E. Evaluate logarithmic expressions without the use of a calculator
F. Bound the size of a logarithmic expression between consecutive integers
G. Simplify logarithmic expressions algebraically
H. Explain what common and natural logarithms are
I. Solve exponential equations to obtain symbolic and numeric solutions
J. Solve logarithmic equations

XV. Sequences and Series

A. Calculate terms in a sequence given an explicit or recursive rule
B. Find an explicit or recursive rule for a given sequence

C. Calculate the value of a specified term or the common difference in an arithmetic sequence
D. Insert arithmetic means between given numbers
E. Calculate the value of a specified term or the common ratio of a geometric sequence
F. Insert geometric means between given values
G. Expand a given series in sigma notation
H. Write an expanded series in sigma notation
I. Find the sum, value of a specified term, or the common difference of a given arithmetic series
J. Find the sum, value of a specified term, or the common ratio of a given geometric series
K. Specify whether a given infinite geometric series converges, and find its sum if it does
L. Find the value of a specified term or the common ratio of a given convergent infinite geometric series