Prep for Calculus

This course covers the topics outlined below. You can customize the scope and sequence of this course to meet your curricular needs.

Curriculum (281 topics + 125 additional topics)

- Real Numbers (27 topics)
  - Fractions (5 topics)
    - Simplifying a fraction
    - Using a common denominator to order fractions
    - Addition or subtraction of fractions with different denominators
    - Fraction multiplication
    - Fraction division
  - Percents and Proportions (7 topics)
    - Converting between percentages and decimals
    - Applying the percent equation
    - Finding the sale price without a calculator given the original price and percent discount
    - Finding the original price given the sale price and percent discount
    - Solving a proportion of the form \( x/a = b/c \)
    - Word problem on proportions: Problem type 1
    - Word problem on proportions: Problem type 2
- Signed Numbers (15 topics)
  - Integer addition: Problem type 2
  - Integer subtraction: Problem type 3
  - Signed fraction addition or subtraction: Basic
  - Signed fraction addition or subtraction: Advanced
  - Signed decimal addition and subtraction with 3 numbers
  - Integer multiplication and division
  - Signed fraction multiplication: Basic
  - Signed fraction multiplication: Advanced
  - Exponents and integers: Problem type 1
  - Exponents and signed fractions
  - Order of operations with integers and exponents
  - Evaluating a linear expression: Integer multiplication with addition or subtraction
  - Evaluating a quadratic expression: Integers
  - Absolute value of a number
  - Operations with absolute value: Problem type 2
- Equations and Inequalities (24 topics)
  - Linear Equations (15 topics)
    - Additive property of equality with integers
    - Multiplicative property of equality with signed fractions
    - Solving a two-step equation with integers
    - Solving a two-step equation with signed fractions
    - Solving a linear equation with several occurrences of the variable: Variables on the same side and distribution
    - Solving a linear equation with several occurrences of the variable: Variables on both sides and
fractional coefficients
◊ Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution
◊ Solving a linear equation with several occurrences of the variable: Variables on both sides and two distributions
◊ Solving a linear equation with several occurrences of the variable: Fractional forms with binomial numerators
◊ Solving equations with zero, one, or infinitely many solutions
◊ Algebraic symbol manipulation: Problem type 1
◊ Algebraic symbol manipulation: Problem type 2
◊ Solving a word problem with two unknowns using a linear equation
◊ Solving a decimal word problem using a linear equation of the form $Ax + B = C$
◊ Solving a value mixture problem using a linear equation

♦ Linear Inequalities (6 topics)
◊ Solving a linear inequality: Problem type 2
◊ Solving a linear inequality: Problem type 3
◊ Solving a linear inequality: Problem type 4
◊ Graphing a compound inequality on the number line
◊ Solving a compound linear inequality: Graph solution, basic
◊ Solving a compound linear inequality: Interval notation

♦ Absolute Value Equations and Inequalities (3 topics)
◊ Solving an absolute value equation of the form $a|x| = b$ or $|x|+a = b$
◊ Solving an absolute value equation of the form $|ax+b| = c$
◊ Solving an absolute value inequality: Basic

• Exponents and Polynomials (43 topics)
♦ Properties of Exponents (13 topics)
◊ Evaluating an expression with a negative exponent: Positive fraction base
◊ Evaluating an expression with a negative exponent: Negative integer base
◊ Introduction to the product rule of exponents
◊ Product rule with positive exponents: Multivariate
◊ Product rule with negative exponents
◊ Quotient of expressions involving exponents
◊ Quotient rule with negative exponents: Problem type 1
◊ Introduction to the power rules of exponents
◊ Power rules with positive exponents
◊ Power of a power rule with negative exponents
◊ Power rules with negative exponents
◊ Power and product rules with positive exponents
◊ Power, product, and quotient rules with negative exponents

♦ Scientific Notation (2 topics)
◊ Scientific notation with positive exponent
◊ Scientific notation with negative exponent

♦ Polynomial Expressions (9 topics)
◊ Degree and leading coefficient of a univariate polynomial
◊ Combining like terms: Advanced
◊ Simplifying a sum or difference of two univariate polynomials
◊ Multiplying a univariate polynomial by a monomial with a positive coefficient
◊ Multiplying a multivariate polynomial by a monomial
◊ Multiplying binomials with leading coefficients of 1
◊ Multiplying conjugate binomials: Univariate
◊ Squaring a binomial: Univariate
◊ Multiplication involving binomials and trinomials in two variables

♦ Factoring (9 topics)
Introduction to the GCF of two monomials
◊ Greatest common factor of two multivariate monomials
◊ Factoring out a monomial from a polynomial: Univariate
◊ Factoring out a monomial from a polynomial: Multivariate
◊ Factoring a quadratic with leading coefficient 1
◊ Factoring a quadratic with leading coefficient greater than 1
◊ Factoring a product of a quadratic trinomial and a monomial
◊ Factoring a difference of squares
◊ Factoring a polynomial by grouping: Problem type 1
◆ Quadratic Equations (10 topics)
◊ Solving an equation written in factored form
◊ Finding the roots of a quadratic equation with leading coefficient 1
◊ Finding the roots of a quadratic equation with leading coefficient greater than 1
◊ Solving a quadratic equation needing simplification
◊ Solving a quadratic equation using the square root property: Exact answers, basic
◊ Completing the square
◊ Applying the quadratic formula: Exact answers
◊ Solving a word problem using a quadratic equation with rational roots
◊ Solving a word problem using a quadratic equation with irrational roots
◊ Solving a quadratic inequality written in factored form

• Lines and Systems (30 topics)
◆ Ordered Pairs (2 topics)
◊ Plotting a point in the coordinate plane
◊ Finding a solution to a linear equation in two variables
◆ Graphing Lines (5 topics)
◊ Graphing a line given its x- and y-intercepts
◊ Graphing a line given its equation in slope-intercept form
◊ Graphing a line given its equation in standard form
◊ Graphing a line through a given point with a given slope
◊ Graphing a vertical or horizontal line
◆ Equations of Lines (13 topics)
◊ Finding the y-intercept of a line given its equation
◊ Finding x- and y-intercepts of a line given the equation: Advanced
◊ Finding slope given the graph of a line on a grid
◊ Finding slope given two points on the line
◊ Finding the slope of a line given its equation
◊ Writing an equation of a line given the y-intercept and another point
◊ Writing the equation of a line given the slope and a point on the line
◊ Writing the equation of the line through two given points
◊ Finding slopes of lines parallel and perpendicular to a line given in the form Ax + By = C
◊ Writing equations of lines parallel and perpendicular to a given line through a point
◊ Writing an equation and drawing its graph to model a real-world situation: Advanced
◊ Application problem with a linear function: Finding a coordinate given the slope and a point
◊ Application problem with a linear function: Finding a coordinate given two points
◆ Graphing Linear Inequalities (2 topics)
◊ Graphing a linear inequality in the plane: Standard form
◊ Graphing a linear inequality in the plane: Vertical or horizontal line
◆ Systems of Linear Equations (8 topics)
◊ Graphically solving a system of linear equations
◊ Solving a system of linear equations using substitution
◊ Solving a system of linear equations using elimination with multiplication and addition
◊ Solving a word problem involving a sum and another basic relationship using a system of linear equations
Solving a value mixture problem using a system of linear equations
Solving a distance, rate, time problem using a system of linear equations
Solving a percent mixture problem using a system of linear equations
Interpreting the graphs of two functions

Functions and Graphs (34 topics)
- Sets, Relations, and Functions (10 topics)
  - Union and intersection of finite sets
  - Set–builder and interval notation
  - Union and intersection of intervals
  - Identifying functions from relations
  - Vertical line test
  - Evaluating functions: Linear and quadratic or cubic
  - Evaluating functions: Absolute value, rational, radical
  - Evaluating a piecewise–defined function
  - Variable expressions as inputs of functions: Problem type 1
  - Domain and range from ordered pairs
- Graphs and Transformations (16 topics)
  - Finding intercepts of a nonlinear function given its graph
  - Finding local maxima and minima of a function given the graph
  - Domain and range from the graph of a continuous function
  - Writing an equation for a function after a vertical translation
  - Writing an equation for a function after a vertical and horizontal translation
  - Translating the graph of a function: One step
  - Translating the graph of a function: Two steps
  - Transforming the graph of a function by reflecting over an axis
  - Transforming the graph of a function by shrinking or stretching
  - Finding the x–intercept(s) and the vertex of a parabola
  - Graphing a parabola of the form \( y = ax^2 \)
  - Graphing a parabola of the form \( y = (x−h)^2 + k \)
  - Graphing a parabola of the form \( y = ax^2 + bx + c \): Integer coefficients
  - Rewriting a quadratic function to find the vertex of its graph
  - Graphing a cubic function of the form \( y = ax^3 \)
  - Graphing an absolute value equation in the plane: Advanced
- Polynomial Functions (2 topics)
  - Finding zeros of a polynomial function written in factored form
  - Finding x– and y–intercepts given a polynomial function
- Combining Functions; Composite Functions; Inverse Functions (6 topics)
  - Sum, difference, and product of two functions
  - Quotient of two functions: Basic
  - Composition of two functions: Basic
  - Composition of two functions: Advanced
  - Inverse functions: Linear, discrete
  - Inverse functions: Rational

Rational Expressions (30 topics)
- Rational Expressions (20 topics)
  - Domain of a rational function: Excluded values
  - Simplifying a ratio of polynomials: Problem type 1
  - Simplifying a ratio of polynomials: Problem type 2
  - Simplifying a ratio of multivariate polynomials
  - Multiplying rational expressions involving multivariate monomials
  - Multiplying rational expressions involving quadratics with leading coefficients of 1
  - Dividing rational expressions involving multivariate monomials
  - Introduction to the LCM of two monomials
◊ Least common multiple of two monomials
◊ Adding rational expressions with common denominators and binomial numerators
◊ Adding rational expressions with different denominators: ax, bx
◊ Adding rational expressions with multivariate monomial denominators: Advanced
◊ Adding rational expressions with different denominators: x+a, x+b
◊ Complex fraction without variables: Problem type 1
◊ Complex fraction without variables: Problem type 2
◊ Complex fraction involving multivariate monomials
◊ Complex fraction: GCF and quadratic factoring
◊ Dividing a polynomial by a monomial: Univariate
◊ Polynomial long division: Problem type 1
◊ Polynomial long division: Problem type 2
♦ Rational Equations (6 topics)
  ◊ Solving a rational equation that simplifies to linear: Denominator x
  ◊ Solving a rational equation that simplifies to linear: Denominator x+a
  ◊ Solving a rational equation that simplifies to linear: Unlike binomial denominators
  ◊ Solving a rational equation that simplifies to linear: Denominators a, x, or ax
  ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators
  ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators
♦ Applications of Rational Expressions (2 topics)
  ◊ Word problem on direct variation
  ◊ Word problem on inverse variation
♦ Rational Functions (2 topics)
  ◊ Sketching the graph of a rational function: Constant over linear
  ◊ Sketching the graph of a rational function: Linear over linear
♦ Radical Expressions (26 topics)
  ◊ Radical Functions (2 topics)
    ◊ Domain of a square root function: Advanced
    ◊ Graphing a square root function
  ◊ Radical Expressions (15 topics)
    ◊ Square root of a rational perfect square
    ◊ Cube root of an integer
    ◊ Simplifying the square root of a whole number less than 100
    ◊ Square root of a perfect square monomial
    ◊ Simplifying a radical expression with an even exponent
    ◊ Simplifying a radical expression with two variables
    ◊ Simplifying a higher root of a whole number
    ◊ Simplifying a higher radical expression: Multivariate
    ◊ Square root addition or subtraction
    ◊ Simplifying a sum or difference of radical expressions: Multivariate
    ◊ Square root multiplication: Advanced
    ◊ Simplifying a product of radical expressions: Multivariate
    ◊ Simplifying a product involving square roots using the distributive property: Advanced
    ◊ Rationalizing the denominator of a radical expression
    ◊ Rationalizing the denominator of a radical expression using conjugates
  ◊ Higher Roots and Rational Exponents (5 topics)
    ◊ Converting between radical form and exponent form
    ◊ Rational exponents: Non–unit fraction exponent with a whole number base
    ◊ Rational exponents: Negative exponents and fractional bases
    ◊ Rational exponents: Products and quotients with negative exponents
    ◊ Rational exponents: Powers of powers with negative exponents
  ◊ Radical Equations (4 topics)
    ◊ Solving a radical equation that simplifies to a linear equation: One radical, basic
◊ Solving a radical equation that simplifies to a linear equation: Two radicals
◊ Solving a radical equation that simplifies to a quadratic equation: One radical
◊ Solving an equation using the odd-root property: Problem type 1

• Exponentials and Logarithms (20 topics)
  ♦ Properties of Logarithms (7 topics)
    ◊ Converting between logarithmic and exponential equations
    ◊ Converting between natural logarithmic and exponential equations
    ◊ Evaluating a logarithmic expression
    ◊ Basic properties of logarithms
    ◊ Expanding a logarithmic expression: Problem type 1
    ◊ Writing an expression as a single logarithm
    ◊ Change of base for logarithms: Problem type 1
  ♦ Logarithmic and Exponential Equations (6 topics)
    ◊ Solving an equation of the form \( \log_b a = c \)
    ◊ Solving a multi-step equation involving a single logarithm
    ◊ Solving a multi-step equation involving natural logarithms
    ◊ Solving an equation involving logarithms on both sides: Problem type 2
    ◊ Solving an exponential equation by using logarithms: Exact answers in logarithmic form
    ◊ Solving exponential equations by using logarithms and natural logarithms: Decimal answers
  ♦ Applications with Exponential Equations (3 topics)
    ◊ Evaluating an exponential function that models a real-world situation
    ◊ Finding a final amount in a word problem on exponential growth or decay
    ◊ Finding the time to reach a limit in a word problem on exponential growth or decay
  ♦ Exponential and Logarithmic Functions (4 topics)
    ◊ Graphing an exponential function and its asymptote: \( f(x) = a(b)^x \)
    ◊ The graph, domain, and range of an exponential function
    ◊ The graph, domain, and range of a logarithmic function
    ◊ Translating the graph of a logarithmic or exponential function

• Geometry (20 topics)
  ♦ Perimeter, Area, and Volume (16 topics)
    ◊ Perimeter of a square or a rectangle
    ◊ Area of a square or a rectangle
    ◊ Area of a piecewise rectangular figure
    ◊ Finding the side length of a rectangle given its perimeter or area
    ◊ Finding the perimeter or area of a rectangle given one of these values
    ◊ Area of a parallelogram
    ◊ Area of a triangle
    ◊ Circumference and area of a circle
    ◊ Perimeter involving rectangles and circles
    ◊ Area involving inscribed figures
    ◊ Volume of a rectangular prism
    ◊ Volume of a cylinder
    ◊ Surface area of a cube or a rectangular prism
    ◊ Surface area of a cylinder: Exact answers in terms of pi
    ◊ Similar polygons
    ◊ Indirect measurement
  ♦ Coordinate Geometry (4 topics)
    ◊ Pythagorean Theorem
    ◊ Distance between two points in the plane: Exact answers
    ◊ Graphing a circle given its equation in standard form
    ◊ Graphing a circle given its equation in general form

• Trigonometry (27 topics)
  ♦ Angles on the Unit Circle (5 topics)
Converting between degree and radian measure: Problem type 1
Sketching an angle in standard position
Reference angles: Problem type 1
Coterminal angles
Arc length and central angle measure

♦ Right Triangle Trigonometry (7 topics)
◊ Sine, cosine, and tangent ratios: Variables for side lengths
◊ Using a trigonometric ratio to find a side length in a right triangle
◊ Using a trigonometric ratio to find an angle measure in a right triangle
◊ Finding trigonometric ratios given a right triangle
◊ Solving a right triangle
◊ Solving a triangle with the law of sines: Problem type 1
◊ Solving a triangle with the law of cosines

♦ Unit Circle Trigonometry (7 topics)
◊ Finding coordinates on the unit circle for special angles
◊ Trigonometric functions and special angles: Problem type 1
◊ Trigonometric functions and special angles: Problem type 2
◊ Trigonometric functions and special angles: Problem type 3
◊ Finding values of trigonometric functions given information about an angle: Problem type 1
◊ Finding values of trigonometric functions given information about an angle: Problem type 2
◊ Finding values of trigonometric functions given information about an angle: Problem type 3

♦ Graphing Trigonometric Functions (2 topics)
◊ Sketching the graph of \( y = a \sin(x+c) \) or \( y = a \cos(x+c) \)
◊ Sketching the graph of \( y = a \sin(bx) \) or \( y = a \cos(bx) \)

♦ Inverse Trigonometric Functions (1 topics)
◊ Values of inverse trigonometric functions

♦ Trigonometric Identities (1 topics)
◊ Simplifying trigonometric expressions

♦ Trigonometric Equations (4 topics)
◊ Finding solutions in an interval for a basic equation involving sine or cosine
◊ Finding solutions in an interval for a basic tangent, cotangent, secant, or cosecant equation
◊ Finding solutions in an interval for a trigonometric equation using Pythagorean identities: Problem type 1
◊ Solving a basic trigonometric equation involving sine or cosine

• Other Topics Available(*) (125 additional topics)
♦ Real Numbers (8 topics)
◊ Fractional part of a circle
◊ Finding the percentage increase or decrease: Advanced
◊ Word problem on unit rates associated with ratios of whole numbers: Decimal answers
◊ Exponents and integers: Problem type 2
◊ Identifying numbers as integers or non–integers
◊ Identifying numbers as rational or irrational
◊ Properties of addition
◊ Properties of real numbers

♦ Equations and Inequalities (7 topics)
◊ Solving an equation to find the value of an expression
◊ Solving a decimal word problem using a linear equation with the variable on both sides
◊ Solving a fraction word problem using a linear equation with the variable on both sides
◊ Writing a multi–step inequality for a real–world situation
◊ Solving a decimal word problem using a two–step linear inequality
◊ Solving a decimal word problem using a linear inequality with the variable on both sides
Solving an absolute value equation of the form |ax+b| = |cx+d|

- Exponents and Polynomials (14 topics)
  - Evaluating expressions with exponents of zero
  - Ordering numbers with positive exponents
  - Ordering numbers with negative exponents
  - Multiplying and dividing numbers written in scientific notation
  - Degree of a multivariate polynomial
  - Simplifying a sum or difference of three univariate polynomials
  - Factoring with repeated use of the difference of squares formula
  - Factoring a sum or difference of two cubes
  - Solving an equation that can be written in quadratic form: Problem type 1
  - Solving a quadratic equation using the square root property: Exact answers, advanced
  - Solving a quadratic equation by completing the square: Exact answers
  - Discriminant of a quadratic equation
  - Writing a quadratic equation given the roots and the leading coefficient
  - Solving a quadratic inequality

- Lines and Systems (7 topics)
  - Determining whether given points lie on one, both, or neither of 2 lines given equations
  - Writing the equations of vertical and horizontal lines through a given point
  - Solving a 3x3 system of linear equations: Problem type 1
  - Solving a 2x2 system of linear equations that is inconsistent or consistent dependent
  - Solving a tax rate or interest rate problem using a system of linear equations
  - Solving a word problem using a 3x3 system of linear equations: Problem type 1
  - Graphing a system of two linear inequalities: Basic

- Functions and Graphs (12 topics)
  - Set−builder notation
  - Finding inputs and outputs of a function from its graph
  - Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
  - Domain and range from the graph of a piecewise function
  - Graphing a parabola of the form y = ax² + bx + c: Rational coefficients
  - Range of a quadratic function
  - Classifying the graph of a function
  - Graphing a piecewise−defined function: Problem type 1
  - Determining the end behavior of the graph of a polynomial function
  - Inferring properties of a polynomial function from its graph
  - Horizontal line test
  - Determining whether two functions are inverses of each other

- Rational Expressions (13 topics)
  - Ordering fractions with variables
  - Dividing rational expressions involving quadratics with leading coefficients of 1
  - Complex fraction made of sums involving rational expressions
  - Solving a rational equation that simplifies to quadratic: Proportional form, advanced
  - Partial fraction decomposition with distinct linear factors
  - Partial fraction decomposition with repeated linear factors
  - Partial fraction decomposition with an irreducible quadratic factor
  - Writing an equation that models variation
  - Word problem on combined variation
  - Word problem on inverse proportions
  - Word problem involving multiple rates
  - Sketching the graph of a rational function: Quadratic over linear
  - Graphing rational functions with holes

- Radical Expressions (9 topics)
  - Special products of radical expressions: Conjugates and squaring
◊ Rationalizing a denominator: Quotient involving higher radicals and monomials
◊ Using \(i\) to rewrite square roots of negative numbers
◊ Simplifying a product and quotient involving square roots of negative numbers
◊ Adding or subtracting complex numbers
◊ Multiplying complex numbers
◊ Dividing complex numbers
◊ Simplifying a power of \(i\)
◊ Solving a quadratic equation with complex roots

♦ Exponentials and Logarithms (7 topics)
◊ Change of base for logarithms: Problem type 2
◊ Solving an equation involving logarithms on both sides: Problem type 1
◊ Solving an exponential equation by finding common bases: Linear and quadratic exponents
◊ Finding the initial or final amount in a word problem on exponential growth or decay
◊ Finding the rate or time in a word problem on continuous exponential growth or decay
◊ Graphing an exponential function and its asymptote: \(f(x) = a(e)^{x-b} + c\)
◊ Graphing a logarithmic function: Advanced

♦ Geometry (13 topics)
◊ Areas of rectangles with the same perimeter
◊ Finding a side length given the perimeter and side lengths with variables
◊ Finding the radius or the diameter of a circle given its circumference
◊ Circumference ratios
◊ Area involving rectangles and circles
◊ Word problem involving the area between two concentric circles
◊ Volume of a cone: Exact answers in terms of \(\pi\)
◊ Volume of a sphere
◊ Word problem involving the rate of filling or emptying a cylinder
◊ Ratio of volumes
◊ Midpoint of a line segment in the plane
◊ Writing an equation of a circle given its center and a point on the circle
◊ Writing an equation of a circle given the endpoints of a diameter

♦ Trigonometry (20 topics)
◊ Area of a sector of a circle
◊ Using trigonometry to find a length in a word problem with one right triangle
◊ Using trigonometry to find angles of elevation or depression in a word problem
◊ Amplitude and period of sine and cosine functions
◊ Amplitude, period, and phase shift of sine and cosine functions
◊ Composition of a trigonometric function with its inverse trigonometric function: Problem type 1
◊ Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 2
◊ Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 3
◊ Using cofunction identities
◊ Sum and difference identities: Problem type 1
◊ Sum and difference identities: Problem type 2
◊ Double–angle identities: Problem type 1
◊ Double–angle identities: Problem type 2
◊ Product–to–sum and sum–to–product identities: Problem type 1
◊ Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
◊ Plotting a point in polar coordinates
◊ Converting rectangular coordinates to polar coordinates: Special angles
◊ Converting polar coordinates to rectangular coordinates
◊ Converting an equation written in rectangular form to one written in polar form
◊ Converting an equation written in polar form to one written in rectangular coordinates
Limits and Continuity (15 topics)
◊ Estimating a limit numerically
◊ Finding limits from a graph
◊ Finding limits for a piecewise-defined function
◊ Finding a limit by using the limit laws: Problem type 1
◊ Finding a limit by using the limit laws: Problem type 2
◊ Finding a limit by using the limit laws: Problem type 3
◊ Squeeze Theorem
◊ Determining points of discontinuity from a graph
◊ Determining a parameter to make a function continuous
◊ Limits at infinity and graphs
◊ Limits at infinity and rational functions
◊ Infinite limits and graphs
◊ Infinite limits and rational functions
◊ Finding a limit of a trigonometric function by using continuity
◊ Finding a limit by using special trigonometric limits

*Other Topics Available  By default, these topics are NOT included in the course, but can be added using the content editor in the Teacher Module.