# 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
• 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 \( y = ax^2 + bx + c \): 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.