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
  ♦ 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
• 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
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.