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 \( \frac{x}{a} = \frac{b}{c} \)
    - 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
• 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.