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 |
|  ◦ Solving a word problem using a quadratic equation with rational roots |

- 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

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◊ 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
◊ 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
*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.