# **ALEKS**<sup>®</sup>

## College Algebra with Trigonometry

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

Curriculum (582 topics)

- Algebra and Geometry Review (184 topics)
  - Real Numbers and Algebraic Expressions (18 topics)
    - ◊ Ordering integers
    - ◊ Identifying numbers as integers or non–integers
    - ◊ Identifying numbers as rational or irrational
    - ◊ Signed fraction addition or subtraction: Basic
    - $\Diamond$  Signed fraction subtraction involving double negation
    - ◊ Signed fraction multiplication: Basic

◊ Signed fraction division

◊ Exponents and integers: Problem type 1

◊ Exponents and integers: Problem type 2

Exponents and signed fractions

**Order** of operations with integers

 $\Diamond$  Order of operations with integers and exponents

**\Diamond** Evaluating a linear expression: Integer multiplication with addition or subtraction

◊ Evaluating a quadratic expression: Integers

**\diamond** Evaluating a linear expression: Signed fraction multiplication with addition or subtraction

◊ Distributive property: Integer coefficients

◊ Using distribution and combining like terms to simplify: Univariate

 $\Diamond$  Using distribution with double negation and combining like terms to simplify: Multivariate

Exponents (28 topics)

 $\Diamond$  Introduction to the product rule of exponents

◊ Product rule with positive exponents: Univariate

◊ Product rule with positive exponents: Multivariate

◊ Introduction to the power of a power rule of exponents

◊ Introduction to the power of a product rule of exponents

◊ Power rules with positive exponents: Multivariate products

♦ Power rules with positive exponents: Multivariate quotients

◊ Power and product rules with positive exponents

◊ Simplifying a ratio of multivariate monomials: Basic

♦ Introduction to the quotient rule of exponents

◊ Simplifying a ratio of univariate monomials

◊ Quotient of expressions involving exponents

◊ Simplifying a ratio of multivariate monomials: Advanced

♦ Power and quotient rules with positive exponents

◊ Evaluating expressions with exponents of zero

◊ Evaluating an expression with a negative exponent: Whole number base

 $\Diamond$  Evaluating an expression with a negative exponent: Positive fraction base

 $\Diamond$  Evaluating an expression with a negative exponent: Negative integer base

◊ Rewriting an algebraic expression without a negative exponent

◊ Introduction to the product rule with negative exponents

♦ Product rule with negative exponents

◊ Quotient rule with negative exponents: Problem type 1

◊ Quotient rule with negative exponents: Problem type 2

◊ Power of a power rule with negative exponents

◊ Power rules with negative exponents

 $\Diamond$  Power and quotient rules with negative exponents: Problem type 1

 $\Diamond$  Power and quotient rules with negative exponents: Problem type 2

◊ Power, product, and quotient rules with negative exponents

Polynomial Expressions (15 topics)

◊ Degree and leading coefficient of a univariate polynomial

◊ Simplifying a sum or difference of two univariate polynomials

◊ Multiplying a univariate polynomial by a monomial with a positive coefficient

◊ Multiplying a univariate polynomial by a monomial with a negative coefficient

♦ Multiplying a multivariate polynomial by a monomial

♦ Multiplying binomials with leading coefficients of 1

♦ Multiplying binomials with leading coefficients greater than 1

◊ Multiplying binomials in two variables

◊ Multiplying conjugate binomials: Univariate

◊ Multiplying conjugate binomials: Multivariate

◊ Squaring a binomial: Univariate

◊ Squaring a binomial: Multivariate

♦ Multiplying binomials with negative coefficients

**◊** Multiplication involving binomials and trinomials in one variable

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◆ Factoring Polynomials (29 topics)

◊ Greatest common factor of 2 numbers

♦ Factoring a linear binomial

◊ Introduction to the GCF of two monomials

**◊** Greatest common factor of three univariate 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 out a binomial from a polynomial: Basic

◊ Factoring a univariate polynomial by grouping: Problem type 1

◊ Factoring a univariate polynomial by grouping: Problem type 2

◊ Factoring a multivariate polynomial by grouping: Problem type 1

◊ Factoring a quadratic with leading coefficient 1

◊ Factoring a quadratic in two variables with leading coefficient 1

◊ Factoring out a constant before factoring a quadratic

◊ Factoring a quadratic with leading coefficient greater than 1: Problem type 1

◊ Factoring a quadratic with leading coefficient greater than 1: Problem type 2

◊ Factoring a quadratic with leading coefficient greater than 1: Problem type 3

◊ Factoring a quadratic in two variables with leading coefficient greater than 1

♦ Factoring a quadratic with a negative leading coefficient

◊ Factoring a perfect square trinomial with leading coefficient 1

◊ Factoring a perfect square trinomial with leading coefficient greater than 1

♦ Factoring a difference of squares in one variable: Basic

◊ Factoring a difference of squares in one variable: Advanced

◊ Factoring a difference of squares in two variables

◊ Factoring a polynomial involving a GCF and a difference of squares: Univariate

◊ Factoring a product of a quadratic trinomial and a monomial

♦ Factoring with repeated use of the difference of squares formula

◊ Factoring a sum or difference of two cubes

◊ Factoring out a binomial from a polynomial: Advanced

♦ Rational Expressions (43 topics)

 $\Diamond$  Restriction on a variable in a denominator: Linear

◊ Simplifying a ratio of factored polynomials: Linear factors

◊ Simplifying a ratio of polynomials using GCF factoring

 $\diamond$  Simplifying a ratio of linear polynomials: 1, -1, and no simplification

◊ Simplifying a ratio of polynomials by factoring a quadratic with leading coefficient 1

◊ Simplifying a ratio of polynomials: Problem type 1

◊ Simplifying a ratio of polynomials: Problem type 2

Multiplying rational expressions involving multivariate monomials

◊ Multiplying rational expressions made up of linear expressions

**◊** Multiplying rational expressions involving quadratics with leading coefficients of 1

◊ Dividing rational expressions involving multivariate monomials

**Oividing rational expressions involving linear expressions** 

**◊** Dividing rational expressions involving quadratics with leading coefficients of 1

◊ Least common multiple of 2 numbers

♦ Least common multiple of 3 numbers

 $\Diamond$  Introduction to the LCM of two monomials

◊ Finding the LCD of rational expressions with linear denominators: Relatively prime

◊ Finding the LCD of rational expressions with linear denominators: Common factors

 $\Diamond$  Writing equivalent rational expressions with monomial denominators

◊ Writing equivalent rational expressions with polynomial denominators

**O** Writing equivalent rational expressions involving opposite factors

◊ Introduction to adding fractions with variables and common denominators

◊ Adding rational expressions with common denominators and monomial numerators

 $\Diamond$  Adding rational expressions with common denominators and binomial numerators

 $\Diamond$  Adding rational expressions with common denominators and GCF factoring

◊ Adding rational expressions with common denominators and quadratic factoring

Adding rational expressions with different denominators and a single occurrence of a variable

◊ Adding rational expressions with denominators ax and bx: Basic

◊ Adding rational expressions with denominators ax and bx: Advanced

**Adding rational expressions with denominators ax**<sup>n</sup> and bx<sup>m</sup>

◊ Adding rational expressions with linear denominators without common factors: Basic

**Adding rational expressions with linear denominators without common factors: Advanced** 

◊ Adding rational expressions with linear denominators with common factors: Basic

◊ Adding rational expressions with denominators ax–b and b–ax

◊ Complex fraction without variables: Problem type 1

◊ Complex fraction without variables: Problem type 2

◊ Complex fraction involving univariate monomials

♦ Complex fraction: GCF factoring

◊ Complex fraction: Quadratic factoring

**\circle Complex fraction made of sums involving rational expressions: Problem type 1** 

◊ Complex fraction made of sums involving rational expressions: Problem type 2

◊ Complex fraction made of sums involving rational expressions: Problem type 3

<sup>(</sup> Complex fraction made of sums involving rational expressions: Problem type 4

• Perfect Squares and nth Roots (10 topics)

 $\Diamond$  Finding all square roots of a number

◊ Square root of a rational perfect square

◊ Square roots of perfect squares with signs

◊ Square roots of integers raised to even exponents

◊ Introduction to simplifying a radical expression with an even exponent

◊ Square root of a perfect square monomial

◊ Introduction to solving an absolute value equation

♦ Cube root of an integer

◊ Finding n<sup>th</sup> roots of perfect n<sup>th</sup> powers with signs

◊ Finding the n<sup>th</sup> root of a perfect n<sup>th</sup> power monomial

• Rational Exponents (8 topics)

◊ Converting between radical form and exponent form

◊ Rational exponents: Unit fraction exponents and whole number bases

◊ Rational exponents: Unit fraction exponents and bases involving signs

- ◊ Rational exponents: Non–unit fraction exponent with a whole number base
- ◊ Rational exponents: Negative exponents and fractional bases

◊ Rational exponents: Product rule

◊ Rational exponents: Quotient rule

◊ Rational exponents: Power of a power rule

Radical Expressions (28 topics)

**§** Simplifying the square root of a whole number less than 100

 $\diamond$  Simplifying the square root of a whole number greater than 100

◊ Simplifying a radical expression with an even exponent

◊ Introduction to simplifying a radical expression with an odd exponent

 $\Diamond$  Simplifying a radical expression with an odd exponent

◊ Simplifying a radical expression with two variables

◊ Simplifying a higher root of a whole number

◊ Introduction to simplifying a higher radical expression

◊ Simplifying a higher radical expression: Univariate

◊ Introduction to square root addition or subtraction

◊ Square root addition or subtraction

◊ Introduction to simplifying a sum or difference of radical expressions: Univariate

◊ Simplifying a sum or difference of radical expressions: Univariate

 $\Diamond$  Introduction to square root multiplication

◊ Square root multiplication: Basic

**§** Square root multiplication: Advanced

◊ Introduction to simplifying a product of radical expressions: Univariate

◊ Simplifying a product of radical expressions: Univariate

◊ Introduction to simplifying a product involving square roots using the distributive property

◊ Simplifying a product involving square roots using the distributive property: Basic

◊ Simplifying a product involving square roots using the distributive property: Advanced

◊ Special products of radical expressions: Conjugates and squaring

◊ Simplifying a quotient of square roots

◊ Simplifying a quotient involving a sum or difference with a square root

◊ Rationalizing a denominator: Quotient involving square roots

◊ Rationalizing a denominator: Square root of a fraction

◊ Rationalizing a denominator using conjugates: Integer numerator

◊ Rationalizing a denominator using conjugates: Square root in numerator

♦ Geometry (5 topics)

◊ Circumference of a circle

◊ Volume of a rectangular prism

 $\Diamond$  Introduction to the Pythagorean Theorem

◊ Pythagorean Theorem

♦ Word problem involving the Pythagorean Theorem

#### • Equations and Inequalities (118 topics)

• Linear Equations and Applications (34 topics)

 $\Diamond$  Additive property of equality with signed fractions

**◊** Multiplicative property of equality with signed fractions

◊ Solving a multi–step equation given in fractional form

- 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 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 monomial numerators
- ◊ Solving a two−step equation with signed fractions
- 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: Fractional forms with binomial numerators
- ◊ Solving equations with zero, one, or infinitely many solutions

 $\bigcirc$  Solving a proportion of the form (x+a)/b = c/d

◊ Solving for a variable in terms of other variables using addition or subtraction: Basic

**§** Solving for a variable in terms of other variables using addition or subtraction: Advanced

- ◊ Solving for a variable in terms of other variables using multiplication or division: Basic
- **§** Solving for a variable in terms of other variables using multiplication or division: Advanced
- ◊ Solving for a variable in terms of other variables using addition or subtraction with division

◊ Solving for a variable inside parentheses in terms of other variables

◊ Solving for a variable in terms of other variables in a linear equation with fractions

◊ Translating a sentence into a one−step equation

◊ Translating a sentence into a multi–step equation

◊ Solving a word problem with two unknowns using a linear equation

 $\diamond$  Solving a decimal word problem using a linear equation of the form Ax + B = C

◊ Solving a word problem with three unknowns using a linear equation

♦ Writing a multi–step equation for a real–world situation

◊ Solving a value mixture problem using a linear equation

 $\diamond$  Solving a one-step word problem using the formula d = rt

◊ Solving a distance, rate, time problem using a linear equation

◊ Finding the perimeter or area of a rectangle given one of these values

◊ Finding the multiplier to give a final amount after a percentage increase or decrease

◊ Finding the sale price given the original price and percent discount

♦ Computing a percent mixture

◊ Solving a percent mixture problem using a linear equation

♦ Finding simple interest without a calculator

♦ Absolute Value Equations (4 topics)

◊ Solving an absolute value equation: Problem type 1

◊ Solving an absolute value equation: Problem type 2

◊ Solving an absolute value equation: Problem type 3

♦ Solving an absolute value equation: Problem type 4

• Linear Inequalities and Applications (21 topics)

◊ Translating a sentence into a one−step inequality

◊ Translating a sentence into a multi–step inequality

◊ Writing an inequality for a real–world situation

◊ Graphing a linear inequality on the number line

♦ Translating a sentence into a compound inequality

◊ Graphing a compound inequality on the number line

♦ Set builder and interval notation

◊ Union and intersection of finite sets

◊ Union and intersection of intervals

◊ Identifying solutions to a two–step linear inequality in one variable

◊ Additive property of inequality with signed fractions

♦ Multiplicative property of inequality with signed fractions

◊ Solving a two–step linear inequality: Problem type 1

◊ Solving a two–step linear inequality: Problem type 2

◊ Solving a two-step linear inequality with a fractional coefficient

 $\Diamond$  Solving a linear inequality with multiple occurrences of the variable: Problem type 1

 $\Diamond$  Solving a linear inequality with multiple occurrences of the variable: Problem type 2

 $\Diamond$  Solving a linear inequality with multiple occurrences of the variable: Problem type 3

◊ Solving a compound linear inequality: Graph solution, basic

 $\Diamond$  Solving a decimal word problem using a two–step linear inequality

 $\diamond$  Solving a decimal word problem using a linear inequality with the variable on both sides

- Absolute Value Inequalities (5 topics)
  - ◊ Solving an absolute value inequality: Problem type 1
    - $\Diamond$  Solving an absolute value inequality: Problem type 2

 $\Diamond$  Solving an absolute value inequality: Problem type 3

◊ Solving an absolute value inequality: Problem type 4

♦ Solving an absolute value inequality: Problem type 5

• Rational Equations that Simplify to Linear (9 topics)

Solving a proportion of the form a/(x+b) = c/x

 $\Diamond$  Solving a rational equation that simplifies to linear: Denominator x

 $\Diamond$  Solving a rational equation that simplifies to linear: Denominator x+a

 $\Diamond$  Solving a rational equation that simplifies to linear: Denominators a, x, or ax

◊ Solving a rational equation that simplifies to linear: Denominators ax and bx

 $\Diamond$  Solving a rational equation that simplifies to linear: Like binomial denominators

 $\Diamond$  Solving a rational equation that simplifies to linear: Unlike binomial denominators

 $\Diamond$  Solving for a variable in terms of other variables in a rational equation: Problem type 1

♦ Solving for a variable in terms of other variables in a rational equation: Problem type 2

• Complex Numbers (6 topics)

 $\Diamond$  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* 

• Quadratic Equations (20 topics)

◊ Solving an equation written in factored form

 $\diamond$  Finding the roots of a quadratic equation of the form  $ax^2 + bx = 0$ 

◊ Finding the roots of a quadratic equation with leading coefficient 1

 $\Diamond$  Finding the roots of a quadratic equation with leading coefficient greater than 1

◊ Solving a quadratic equation needing simplification

◊ Roots of a product of polynomials

**◊** Writing a quadratic equation given the roots and the leading coefficient

◊ Solving a word problem using a quadratic equation with rational roots

 $\diamond$  Solving an equation of the form  $x^2 = a$  using the square root property

◊ Solving a quadratic equation using the square root property: Exact answers, basic

 $\Diamond$  Solving a quadratic equation using the square root property: Exact answers, advanced

Occupiely Completing the square

◊ Solving a quadratic equation by completing the square: Exact answers

◊ Applying the quadratic formula: Exact answers

◊ Applying the quadratic formula: Decimal answers

 $\Diamond$  Solving a quadratic equation with complex roots

◊ Discriminant of a quadratic equation

◊ Solving a word problem using a quadratic equation with irrational roots

- ◊ Solving an equation using the odd–root property: Problem type 1
- ♦ Solving an equation using the odd–root property: Problem type 2
- ◆ Rational Equations that Simplify to Quadratic (6 topics)
  - ♦ Restriction on a variable in a denominator: Quadratic
  - $\Diamond$  Solving a rational equation that simplifies to linear: Factorable quadratic denominator
  - **§** Solving a rational equation that simplifies to quadratic: Proportional form, basic
  - $\Diamond$  Solving a rational equation that simplifies to quadratic: Denominator x
  - ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators
  - ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators
- Radical Equations (13 topics)
  - $\Diamond$  Introduction to solving a radical equation
  - $\Diamond$  Solving a radical equation that simplifies to a linear equation: One radical, basic
  - **§** Solving a radical equation that simplifies to a linear equation: One radical, advanced
  - **§** Solving a radical equation that simplifies to a linear equation: Two radicals
  - ◊ Solving a radical equation that simplifies to a quadratic equation: One radical, basic
  - $\Diamond$  Solving a radical equation that simplifies to a quadratic equation: One radical, advanced
  - ◊ Solving a radical equation that simplifies to a quadratic equation: Two radicals
  - ◊ Algebraic symbol manipulation with radicals
  - **\\$** Word problem involving radical equations: Basic
  - $\Diamond$  Word problem involving radical equations: Advanced
  - $\Diamond$  Solving an equation with a root index greater than 2: Problem type 1
  - $\Diamond$  Solving an equation with a root index greater than 2: Problem type 2
- ◊ Solving an equation that can be written in quadratic form: Problem type 1
- Graphs and Functions (116 topics)
  - Graphs of Equations (20 topics)
    - $\Diamond$  Reading a point in the coordinate plane
    - $\Diamond$  Plotting a point in the coordinate plane
    - $\Diamond$  Table for a linear equation
    - ◊ Identifying solutions to a linear equation in two variables
    - $\Diamond$  Finding a solution to a linear equation in two variables
    - $\Diamond$  Graphing a linear equation of the form y = mx
    - ◊ Graphing a line given its equation in slope–intercept form: Integer slope
    - **\\$** Graphing a line given its equation in slope-intercept form: Fractional slope
    - **◊** Graphing a line given its equation in standard form
    - ◊ Graphing a vertical or horizontal line
    - ◊ Finding x- and y-intercepts given the graph of a line on a grid
    - ◊ Finding x- and y-intercepts of a line given the equation: Basic
    - ◊ Finding x- and y-intercepts of a line given the equation: Advanced
    - ◊ Graphing a line given its x− and y−intercepts
    - $\Diamond$  Graphing a line by first finding its x- and y-intercepts
    - ◊ Finding intercepts of a nonlinear function given its graph
    - $\Diamond$  Graphing an absolute value equation of the form y=A|x|
    - $\diamond$  Graphing a parabola of the form  $y = ax^2$
    - $\diamond$  Graphing a parabola of the form  $y = ax^2 + c$
    - $\diamond$  Graphing a cubic function of the form  $y = ax^3$
  - ♦ Slope and Equations of Lines (20 topics)
    - ◊ Classifying slopes given graphs of lines
    - ♦ Finding slope given the graph of a line on a grid
    - ◊ Finding slope given two points on the line
    - ◊ Finding the slope of horizontal and vertical lines
    - ♦ Graphing a line given its slope and y–intercept
    - ◊ Graphing a line through a given point with a given slope
    - $\diamond$  Rewriting a linear equation in the form Ax + By = C

y = mx + b
$\Diamond$ Finding the slope and y-intercept of a line given its equation in the form Ax + By = C
◊ Graphing a line by first finding its slope and y−intercept
$\Diamond$ Writing an equation of a line given its slope and v-intercept
Writing an equation in slope-intercept form given the slope and a point
Writing an equation in point-slope form given the slope and a point
$\Diamond$ Writing an equation of a line given the y-intercept and another point
• Writing the equation of the line through two given points
$\Diamond$ Writing the equations of vertical and horizontal lines through a given point
♦ Finding slopes of lines parallel and perpendicular to a line given in slope–intercept form
$\Diamond$ Finding slopes of lines parallel and perpendicular to a line given in the form Ax + By = C
◊ Identifying parallel and perpendicular lines from equations
• Writing equations of lines parallel and perpendicular to a given line through a point
◆ Linear Applications (5 topics)
Writing and evaluating a function that models a real–world situation: Advanced
◊ Writing an equation and drawing its graph to model a real–world situation: Advanced
◊ Interpreting the parameters of a linear function that models a real–world situation
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
♦ Distance and Midpoint Formulas; Circles (6 topics)
◊ Distance between two points in the plane: Exact answers
♦ Midpoint of a line segment in the plane
◊ Graphing a circle given its equation in standard form
◊ Graphing a circle given its equation in general form: Basic
Writing an equation of a circle given its center and a point on the circle
Viriting an equation of a circle given the endpoints of a diameter
◆ Functions (21 topics)
Identifying functions from relations
◊ Vertical line test
♦ Table for a linear function
Evaluating functions: Linear and quadratic or cubic
◊ Evaluating a rational function: Problem type 1
Evaluating a rational function: Problem type 2
♦ Table for a square root function
© Evaluating functions: Absolute value, rational, radical
© Evaluating a piecewise–defined function
Variable expressions as inputs of functions
ODomain and range from ordered pairs
ODomain of a rational function
ODomain of a square root function: Basic
<ul> <li>Domain of a square root function: Advanced</li> <li>A Finding the demain of a functional function investigation and inclusion.</li> </ul>
<ul> <li>Finding the domain of a fractional function involving radicals</li> <li>Determining relations according to fingure functions Design</li> </ul>
Determining whether an equation defines a function: Basic
$\diamond$ Determining whether an equation defines a function. Advanced
$\diamond$ Finding outputs of a two-step function with desirals that models a real-world situation. Function for the step function with desirals that models a real-world situation.
v Finding outputs of a two-step function with decimals that models a real-world situation. Function
$\delta$ Finding inputs and outputs of a two-step function that models a real-world situation: Function
notation
$\Diamond$ Finding a difference quotient for a function
◆ Graphs of Functions (20 topics)
♦ Finding an output of a function from its graph
♦ Finding inputs and outputs of a function from its graph

◊ Domain and range from the graph of a discrete relation

 $\Diamond$  Domain and range from the graph of a continuous function

 $\Diamond$  Domain and range from the graph of a piecewise function

 $\Diamond$  Finding where a function is increasing, decreasing, or constant given the graph

◊ Finding where a function is increasing, decreasing, or constant given the graph: Interval notation

◊ Finding local maxima and minima of a function given the graph

 $\diamond$  Graphing a function of the form f(x) = ax + b: Integer slope

 $\Diamond$  Graphing a function of the form f(x) = ax + b: Fractional slope

◊ Graphing an absolute value equation in the plane: Basic

**◊** Graphing an absolute value equation in the plane: Advanced

 $\diamond$  Graphing a function of the form  $f(x) = ax^2$ 

 $\diamond$  Graphing a function of the form  $f(x) = ax^2 + c$ 

 $\bigcirc$  Graphing a parabola of the form  $y = (x-a)^2 + c$ 

 $\Diamond$  Graphing a square root function: Problem type 1

 $\Diamond$  Graphing a square root function: Problem type 2

◊ Graphing a piecewise–defined function

◊ Finding the average rate of change of a function

 $\Diamond$  Finding the average rate of change of a function given its graph

◆ Transformations (12 topics)

 $\Diamond$  Even and odd functions

◊ Translating the graph of a parabola: One step

 $\Diamond$  How the leading coefficient affects the shape of a parabola

◊ Translating the graph of an absolute value function: One step

 $\Diamond$  Translating the graph of an absolute value function: Two steps

 $\Diamond$  Writing an equation for a function after a vertical translation

 $\Diamond$  Translating the graph of a function: One step

 $\Diamond$  Translating the graph of a function: Two steps

 $\Diamond$  Transforming the graph of a function by reflecting over an axis

◊ Transforming the graph of a function by shrinking or stretching

◊ Transforming the graph of a function using more than one transformation

**\Diamond** Writing an equation for a function after a vertical and horizontal translation

• Combining Functions; Composite Functions; Inverse Functions (12 topics)

Sum, difference, and product of two functions

◊ Quotient of two functions

◊ Combining functions: Advanced

◊ Composition of two functions: Basic

◊ Expressing a function as a composition of two functions

**Operation** Operation of two functions: Domain and range

Ocomposition of two functions: Advanced

♦ Horizontal line test

 $\Diamond$  Determining whether two functions are inverses of each other

◊ Inverse functions: Problem type 1

♦ Inverse functions: Problem type 2

♦ Inverse functions: Problem type 3

• Polynomial and Rational Functions (52 topics)

◆ Quadratic Functions (11 topics)

◊ Finding the vertex, x−intercepts, and axis of symmetry from the graph of a parabola

 $\diamond$  Graphing a parabola of the form  $y = x^2 + bx + c$ 

 $\diamond$  Graphing a parabola of the form  $y = ax^2 + bx + c$ : Integer coefficients

◊ Finding the x−intercept(s) and the vertex of a parabola

**(**) Using a graphing calculator to find the x-intercept(s) and vertex of a quadratic function

◊ Rewriting a quadratic function to find the vertex of its graph

 $\Diamond$  Finding the maximum or minimum of a quadratic function

- **\\$** Word problem involving the maximum or minimum of a quadratic function
- ◊ Domain and range from the graph of a parabola
- ♦ Range of a quadratic function
- $\diamond$  Writing the equation of a quadratic function given its graph
- Polynomial Functions (8 topics)
  - $\Diamond$  Finding zeros of a polynomial function written in factored form
  - $\Diamond$  Finding a polynomial of a given degree with given zeros: Real zeros
  - $\Diamond$  Finding x– and y–intercepts given a polynomial function
  - $\Diamond$  Determining the end behavior of the graph of a polynomial function
  - $\Diamond$  Matching graphs with polynomial functions
  - $\Diamond$  Inferring properties of a polynomial function from its graph
  - $\Diamond$  Using a graphing calculator to find local extrema of a polynomial function
  - ♦ Using a graphing calculator to solve a word problem involving a local extremum of a polynomial function
- Division of Polynomials; Remainder and Factor Theorems (6 topics)
  - ◊ Polynomial long division: Problem type 1
  - $\Diamond$  Polynomial long division: Problem type 2
  - Olynomial long division: Problem type 3
  - $\Diamond$  Synthetic division
  - $\Diamond$  Using the remainder theorem to evaluate a polynomial
  - ♦ The Factor Theorem
- Real Zeros of Polynomial Functions (7 topics)
  - ◊ Using a given zero to write a polynomial as a product of linear factors: Real zeros
  - ◊ Finding all possible rational zeros using the rational zeros theorem: Problem type 1
  - $\Diamond$  Finding all possible rational zeros using the rational zeros theorem: Problem type 2
  - $\Diamond$  Using the rational zeros theorem to find all zeros of a polynomial: Rational zeros
  - $\Diamond$  Using the rational zeros theorem to find all zeros of a polynomial: Irrational zeros
  - ◊ Using a graphing calculator to find zeros of a polynomial function
  - **\Using a graphing calculator to solve a word problem involving a polynomial of degree 3**
- ♦ Complex Zeros of Polynomials Functions (6 topics)
  - ◊ Multiplying expressions involving complex conjugates
  - $\Diamond$  Finding a polynomial of a given degree with given zeros: Complex zeros
  - ◊ Using a given zero to write a polynomial as a product of linear factors: Complex zeros
  - ◊ Using the rational zeros theorem to find all zeros of a polynomial: Complex zeros
  - ◊ Using the conjugate zeros theorem to find all zeros of a polynomial
  - ◊ Linear factors theorem and conjugate zeros theorem
- Rational Functions (9 topics)
  - ◊ Finding the asymptotes of a rational function: Constant over linear
  - ◊ Finding the asymptotes of a rational function: Linear over linear
  - $\Diamond$  Finding the asymptotes of a rational function: Advanced
  - ◊ Graphing a rational function: Constant over linear
  - ◊ Graphing a rational function: Linear over linear
  - ◊ Graphing a rational function: Problem type 2
  - ◊ Graphing rational functions with holes
  - $\Diamond$  Matching graphs with rational functions: Two vertical asymptotes
  - ♦ Writing the equation of a rational function given its graph
- Polynomial and Rational Inequalities (5 topics)
  - ◊ Solving a quadratic inequality written in factored form
    - ◊ Solving a quadratic inequality
    - ◊ Solving a polynomial inequality
    - $\Diamond$  Solving a rational inequality: Problem type 1
    - ♦ Solving a rational inequality: Problem type 2
- Exponential and Logarithmic Functions (34 topics)

• Graphing Exponential Functions (5 topics)

♦ Table for an exponential function

 $\Diamond$  Graphing an exponential function and its asymptote:  $f(x) = a(b)^x$ 

◊ Translating the graph of an exponential function

 $\Diamond$  The graph, domain, and range of an exponential function

 $\diamond$  Graphing an exponential function and its asymptote:  $f(x) = a(e)^{x-b} + c$ 

- Applications of Exponential Functions (5 topics)
  - ◊ Evaluating an exponential function that models a real–world situation
  - ◊ Evaluating an exponential function with base e that models a real–world situation

 $\Diamond$  Introduction to compound interest

◊ Finding a final amount in a word problem on exponential growth or decay

Ocompound interest

◆ Logarithmic Functions (7 topics)

**Original Section** Occurrent Converting between logarithmic and exponential equations

**Ore Converting between natural logarithmic and exponential equations** 

◊ Evaluating a logarithmic expression

 $\diamond$  Solving an equation of the form  $\log_b a = c$ 

♦ Translating the graph of a logarithmic function

◊ Graphing a logarithmic function: Basic

- ♦ The graph, domain, and range of a logarithmic function
- Properties of Logarithms (5 topics)

♦ Basic properties of logarithms

◊ Expanding a logarithmic expression: Problem type 1

◊ Expanding a logarithmic expression: Problem type 2

 $\Diamond$  Writing an expression as a single logarithm

♦ Change of base for logarithms: Problem type 1

• Logarithmic and Exponential Equations and Applications (12 topics)

◊ 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 1

◊ Solving an equation involving logarithms on both sides: Problem type 2

◊ Solving an exponential equation by finding common bases: Linear exponents

◊ Solving an exponential equation by finding common bases: Linear and quadratic exponents

**◊** Solving an exponential equation by using logarithms: Decimal answers

◊ Solving an exponential equation by using natural logarithms: Decimal answers

◊ Solving an exponential equation by using logarithms: Exact answers in logarithmic form

◊ Finding the time to reach a limit in a word problem on exponential growth or decay

◊ Finding the initial or final amount in a word problem on exponential growth or decay

 $\Diamond$  Finding the rate or time in a word problem on exponential growth or decay

#### • Trigonometric Functions (45 topics)

• Angles and Their Measure (5 topics)

Oconverting between degree and radian measure: Problem type 1

◊ Converting between degree and radian measure: Problem type 2

◊ Sketching an angle in standard position

♦ Coterminal angles

 $\diamond$  Arc length and central angle measure

• The Unit Circle and Right Triangle Trigonometry (15 topics)

♦ Finding coordinates on the unit circle for special angles

◊ Finding a point on the unit circle given one coordinate

أأ Sine, cosine, and tangent ratios: Variables for side lengths

◊ Trigonometric functions and special angles: Problem type 1

◊ Finding trigonometric ratios from a point on the unit circle

♦ Trigonometric functions and special angles: Problem type 2

◊ Trigonometric functions and special angles: Problem type 3

◊ Using a calculator to approximate sine, cosine, and tangent values

 $\Diamond$  Using the Pythagorean Theorem to find a trigonometric ratio

◊ Finding trigonometric ratios given a right triangle

 $\Diamond$  Using a trigonometric ratio to find a side length in a right triangle

◊ Using trigonometry to find distances

◊ Using a trigonometric ratio to find an angle measure in a right triangle

◊ Using trigonometry to find angles of elevation or depression

♦ Solving a right triangle

• Trigonometric Functions of Angles (6 topics)

◊ Reference angles: Problem type 1

◊ Reference angles: Problem type 2

 $\diamond$  Determining the location of a terminal point given the signs of trigonometric values

 $\Diamond$  Finding values of trigonometric functions given information about an angle: Problem type 1

 $\Diamond$  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

• Graphs of Sine and Cosine Functions (9 topics)

 $\Diamond$  Sketching the graph of a sine or cosine function: Problem type 1

 $\Diamond$  Sketching the graph of a sine or cosine function: Problem type 2

 $\Diamond$  Sketching the graph of a sine or cosine function: Problem type 3

 $\Diamond$  Amplitude and period of sine and cosine functions

◊ Amplitude, period, and phase shift of sine and cosine functions

 $\Diamond$  Writing the equation of a sine or cosine function given its graph: Problem type 1

◊ Writing the equation of a sine or cosine function given its graph: Problem type 2

 $\Diamond$  Word problem involving a sine or cosine function: Problem type 1

♦ Word problem involving a sine or cosine function: Problem type 2

• Graphs of Other Trigonometric Functions (5 topics)

◊ Matching graphs and equations for secant, cosecant, tangent, and cotangent functions

 $\Diamond$  Sketching the graph of a secant or cosecant function: Problem type 1

 $\Diamond$  Sketching the graph of a secant or cosecant function: Problem type 2

 $\Diamond$  Sketching the graph of a tangent or cotangent function: Problem type 1

 $\Diamond$  Sketching the graph of a tangent or cotangent function: Problem type 2

• Inverse Trigonometric Functions (5 topics)

 $\Diamond$  Values of inverse trigonometric functions

◊ Composition of a trigonometric function and an inverse trigonometric function: Problem type 1

◊ Composition of a trigonometric function and an inverse trigonometric function: Problem type 2

◊ Composition of a trigonometric function and an inverse trigonometric function: Problem type 3

© Composition of a trigonometric function and an inverse trigonometric function: Problem type 4

### • Trigonometric Identities and Equations (28 topics)

• Verifying Trigonometric Identities (6 topics)

◊ Simplifying trigonometric expressions

 $\Diamond$  Using cofunction identities

 $\Diamond$  Verifying a trigonometric identity

 $\Diamond$  Proving trigonometric identities: Problem type 1

 $\Diamond$  Proving trigonometric identities: Problem type 2

 $\Diamond$  Proving trigonometric identities: Problem type 3

• Sum and Difference Formulas (4 topics)

 $\Diamond$  Sum and difference identities: Problem type 1

 $\Diamond$  Sum and difference identities: Problem type 2

 $\Diamond$  Sum and difference identities: Problem type 3

 $\Diamond$  Proving trigonometric identities using sum and difference properties

• Double–Angle, Half–Angle, and Product–to–Sum Formulas (6 topics)

♦ Double–angle identities: Problem type 1

◊ Double–angle identities: Problem type 2

♦ Half–angle identities: Problem type 1

◊ Product-to-sum and sum-to-product identities: Problem type 1

 $\Diamond$  Product–to–sum and sum–to–product identities: Problem type 2

◊ Proving trigonometric identities using double–angle properties

◆ Trigonometric Equations (12 topics)

**\Diamond** 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

◊ Solving a basic trigonometric equation using a calculator

◊ Solving a basic trigonometric equation involving sine or cosine

◊ Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant

 $\Diamond$  Finding solutions in an interval for a trigonometric equation in factored form

**§** Finding solutions in an interval for a trigonometric equation with a squared function: Problem type 1

◊ Finding solutions in an interval for a trigonometric equation with a squared function: Problem type 2

◊ Finding solutions in an interval for a trigonometric equation using Pythagorean identities

◊ Finding solutions in an interval for an equation with sine and cosine using double–angle identities

◊ Solving a trigonometric equation modeling a real–world situation

- ♦ Finding solutions in an interval for a trigonometric equation with an angle multiplied by a constant
- Additional Topics in Trigonometry (5 topics)
  - ◆ Laws of Sines and Cosines (5 topics)

 $\Diamond$  Solving a triangle with the law of sines: Problem type 1

 $\Diamond$  Solving a triangle with the law of sines: Problem type 2

 $\Diamond$  Solving a word problem using the law of sines

 $\Diamond$  Solving a triangle with the law of cosines

◊ Solving a word problem using the law of cosines