

# ALEKS<sup>®</sup> Course Syllabus

<b>Course Name:</b> MAC 1140 Summer 16	<b>Course Code:</b> MDPQ6-KWMNC
<b>ALEKS Course:</b> PreCalculus	<b>Instructor:</b> Van De Car
<b>Course Dates:</b> Begin: 05/09/2016 End: 06/17/2016	<b>Course Content:</b> 307 topics
<b>Textbook:</b> Coburn: Precalculus, 2nd Ed. (McGraw-Hill) - ALEKS 360	

Dates	Objective
05/09/2016 - 05/12/2016	1. Alg Review/Eq & Ineq (50 topics)
05/13/2016 - 05/24/2016	2. Functions and Graphs (72 topics)
05/13/2016 - 05/24/2016	3. Polynomial and Rational (74 topics)
05/25/2016 - 06/02/2016	4. Exponential and Log (37 topics)
05/25/2016 - 06/02/2016	5. Systems and Matrices (30 topics)
06/03/2016 - 06/14/2016	6. Sequences and Series (8 topics)
06/03/2016 - 06/14/2016	7. Conic Sections (26 topics)
06/15/2016 - 06/16/2016	8. Limits (10 topics)

## Alg Review/Eq & Ineq (50 topics, due on 05/12/2016)

- Factoring out a monomial from a polynomial: Univariate
- Factoring out a monomial from a polynomial: Multivariate
- 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 multivariate polynomial by grouping: Problem type 2
- Factoring a quadratic with leading coefficient 1
- 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 in two variables with leading coefficient greater than 1
- Factoring a perfect square trinomial with leading coefficient 1
- Factoring a difference of squares in one variable: Basic
- Factoring a difference of squares in one variable: Advanced
- 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: GCF factoring or substitution
- Adding rational expressions with common denominators and binomial numerators
- Adding rational expressions with denominators  $ax$  and  $bx$ : Basic
- Adding rational expressions with denominators  $ax$  and  $bx$ : Advanced
- Adding rational expressions with multivariate monomial denominators: Advanced
- Adding rational expressions with linear denominators without common factors: Basic
- Adding rational expressions with linear denominators without common factors: Advanced
- Adding rational expressions involving different quadratic denominators
- Introduction to solving an absolute value equation
- 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
- Solving an absolute value equation: Problem type 1
- Solving an absolute value equation: Problem type 2

- Solving an absolute value equation of the form  $|ax+b| = |cx+d|$
- Solving a two-step linear inequality: Problem type 1
- Solving a two-step linear inequality: Problem type 2
- Solving a linear inequality with multiple occurrences of the variable: Problem type 3
- Solving a compound linear inequality: Graph solution, basic
- Solving a compound linear inequality: Interval notation
- 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 inequality: Problem type 3
- Solving an absolute value inequality: Problem type 4
- Solving an absolute value inequality: Problem type 5
- 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, basic
- 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
- Solving an equation with a root index greater than 2: Problem type 1
- Solving an equation with a root index greater than 2: Problem type 2
- Solving an equation with exponent  $1/a$ : Problem type 1
- Writing a multi-step inequality for a real-world situation

## Functions and Graphs (72 topics, due on 05/24/2016)

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- Identifying solutions to a linear equation in two variables
- 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 of a line given the equation: Advanced
- Graphing a line by first finding its x- and y-intercepts
- Finding intercepts of a nonlinear function given its graph
- Finding x- and y-intercepts of the graph of a nonlinear equation
- Graphing a parabola of the form  $y = ax^2$
- Graphing a cubic function of the form  $y = ax^3$
- Testing an equation for symmetry about the axes and origin
- Finding slope given the graph of a line on a grid
- Finding slope given two points on the line
- Graphing a line through a given point with a given slope
- 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
- Writing an equation in slope-intercept form given the slope and a point
- Writing an equation of a line given the y-intercept and another point
- Writing the equation of the line through two given points
- Writing the equations of vertical and horizontal lines through a given point
- 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
- Identifying solutions to a system of linear equations
- 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
- Domain of a rational function: Excluded values
- Domain of a square root function: Advanced
- Finding the domain of a fractional function involving radicals
- Determining whether an equation defines a function: Advanced
- Finding a difference quotient for a linear or quadratic function
- Finding inputs and outputs of a function from its graph
- Domain and range from the graph of a continuous function
- Domain and range from the graph of a piecewise function
- 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
- Choosing a graph to fit a narrative: Advanced
- Graphing an absolute value equation in the plane: Advanced
- Graphing a square root function: Problem type 1
- Graphing a square root function: Problem type 2

- Graphing a piecewise-defined function: Problem type 1
- Finding the average rate of change of a function
- Even and odd functions: Problem type 1
- Writing an equation for a function after a vertical 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
- Transforming the graph of a function using more than one transformation
- Writing an equation for a function after a vertical and horizontal translation
- Sum, difference, and product of two functions
- Quotient of two functions: Basic
- Combining functions: Advanced
- Composition of two functions: Basic
- Expressing a function as a composition of two functions
- Composition of two functions: Domain and range
- Composition of two functions: Advanced
- Horizontal line test
- Determining whether two functions are inverses of each other
- Inverse functions: Linear, discrete
- Inverse functions: Rational
- Inverse functions: Quadratic, cubic, radical
- Interpreting the graphs of two functions
- Graphing a linear inequality in the plane: Vertical or horizontal line
- Graphing a linear inequality in the plane: Slope-intercept form
- Graphing a linear inequality in the plane: Standard form

## **Polynomial and Rational** (74 topics, due on 05/24/2016)

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- 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 word problem using a quadratic equation with rational roots
- Solving a quadratic equation using the square root property: Exact answers, basic
- Solving a quadratic equation using the square root property: Exact answers, advanced
- Completing the square
- Solving a quadratic equation by completing the square: Exact answers
- Applying the quadratic formula: Exact answers
- Solving a quadratic equation with complex roots
- Discriminant of a quadratic equation
- Discriminant of a quadratic equation with parameter
- Solving a word problem using a quadratic equation with irrational roots
- Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators
- Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators
- Solving a rational equation that simplifies to quadratic: Proportional form, advanced
- Solving an equation that can be written in quadratic form: Problem type 1
- Solving an equation that can be written in quadratic form: Problem type 2
- Graphing a parabola of the form  $y = (x-h)^2 + k$
- How the leading coefficient affects the shape of a parabola
- Graphing a parabola of the form  $y = ax^2 + bx + c$ : Integer coefficients
- Graphing a parabola of the form  $y = ax^2 + bx + c$ : Rational 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
- Finding the maximum or minimum of a quadratic function
- Word problem involving the maximum or minimum of a quadratic function
- Range of a quadratic function
- Writing the equation of a quadratic function given its graph
- Classifying the graph of a function
- Finding zeros of a polynomial function written in factored form
- Finding a polynomial of a given degree with given zeros: Real zeros
- Finding x- and y-intercepts given a polynomial function
- Determining the end behavior of the graph of a polynomial function
- Matching graphs with polynomial functions
- Inferring properties of a polynomial function from its graph
- 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
- Polynomial long division: Problem type 1

- Polynomial long division: Problem type 2
- Polynomial long division: Problem type 3
- Synthetic division
- Using the remainder theorem to evaluate a polynomial
- The Factor Theorem
- 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
- Finding all possible rational zeros using the rational zeros theorem: Problem type 2
- Using the rational zeros theorem to find all zeros of a polynomial: Rational zeros
- 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
- Multiplying expressions involving complex conjugates
- 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
- Finding the asymptotes of a rational function: Constant over linear
- Finding the asymptotes of a rational function: Linear over linear
- Finding horizontal and vertical asymptotes of a rational function: Quadratic numerator or denominator
- Graphing a rational function: Constant over linear
- Graphing a rational function: Linear over linear
- Graphing a rational function: Quadratic over linear
- Graphing rational functions with holes
- Matching graphs with rational functions: Two vertical asymptotes
- Writing the equation of a rational function given its graph
- Solving a quadratic inequality written in factored form
- Solving a quadratic inequality
- Solving a polynomial inequality
- Solving a rational inequality: Problem type 1
- Solving a rational inequality: Problem type 2
- Graphing a quadratic inequality: Problem type 1
- Graphing a quadratic inequality: Problem type 2

## Exponential and Log (37 topics, due on 06/02/2016)

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- Graphing an exponential function and its asymptote:  $f(x) = a(b)^x$
- Translating the graph of an exponential function
- The graph, domain, and range of an exponential function
- Graphing an exponential function and its asymptote:  $f(x) = a(e)^{x-b} + c$
- Evaluating an exponential function that models a real-world situation
- Evaluating an exponential function with base e that models a real-world situation
- Finding a final amount in a word problem on exponential growth or decay
- Finding the final amount in a word problem on compound interest
- Converting between logarithmic and exponential equations
- Converting between natural logarithmic and exponential equations
- Evaluating a logarithmic expression
- 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
- Domain of a logarithmic function: Advanced
- Graphing a logarithmic function: Advanced
- Basic properties of logarithms
- Expanding a logarithmic expression: Problem type 1
- Expanding a logarithmic expression: Problem type 2
- Writing an expression as a single logarithm
- Change of base for logarithms: Problem type 1
- Change of base for logarithms: Problem type 2
- 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, basic
- Solving an exponential equation by using natural logarithms: Decimal answers
- Solving an exponential equation by using logarithms: Exact answers in logarithmic form

- Solving an exponential equation by using substitution and quadratic factoring
- Using a graphing calculator to solve an exponential or logarithmic equation
- 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
- Finding the rate or time in a word problem on continuous exponential growth or decay

## Systems and Matrices (30 topics, due on 06/02/2016)

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- 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
- Classifying systems of linear equations from graphs
- Solving a 2x2 system of linear equations that is inconsistent or consistent dependent
- Creating an inconsistent system of linear equations
- Consistency and independence of a system of linear equations
- Solving a 3x3 system of linear equations: Problem type 1
- 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 percent mixture problem using a system of linear equations
- Solving a distance, rate, time problem using a system of linear equations
- 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
- Scalar multiplication of a matrix
- Addition or subtraction of matrices
- Linear combination of matrices
- Multiplication of matrices: Basic
- Multiplication of matrices: Advanced
- Solving a system of linear equations given its augmented matrix
- Finding the inverse of a 2x2 matrix
- Finding the inverse of a 3x3 matrix
- Using the inverse of a matrix to solve a 3x3 system of linear equations
- Finding the determinant of a 2x2 matrix
- Finding the determinant of a 3x3 matrix
- Partial fraction decomposition with distinct linear factors
- Partial fraction decomposition with repeated linear factors
- Partial fraction decomposition with an irreducible quadratic factor
- Graphing a system of two linear inequalities: Basic
- Solving a word problem using a system of linear inequalities: Problem type 1

## Sequences and Series (8 topics, due on 06/14/2016)

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- Finding the first terms of a sequence using an explicit rule with multiple occurrences of  $n$
- Finding a specified term of an arithmetic sequence given two terms of the sequence
- Sum of the first  $n$  terms of an arithmetic sequence
- Finding a specified term of a geometric sequence given two terms of the sequence
- Arithmetic and geometric sequences: Identifying and writing an explicit rule
- Sum of the first  $n$  terms of a geometric sequence
- Sum of an infinite geometric series
- Factorial expressions

## Conic Sections (26 topics, due on 06/14/2016)

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- 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
- Writing an equation of a circle given the endpoints of a diameter
- Using a graphing calculator to solve a system of equations
- Solving a system of nonlinear equations: Problem type 1
- Graphing a system of nonlinear inequalities: Problem type 1
- Graphing a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
- Writing an equation of a parabola given the vertex and the focus
- Finding the focus of a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
- Graphing an ellipse given its equation in standard form
- Graphing an ellipse centered at the origin:  $Ax^2 + By^2 = C$
- Graphing an ellipse given its equation in general form
- Finding the foci of an ellipse given its equation in general form

- Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
- Writing an equation of an ellipse given the foci and the major axis length
- Graphing a system of nonlinear inequalities: Problem type 2
- Graphing a hyperbola given its equation in standard form
- Graphing a hyperbola centered at the origin:  $Ax^2 + By^2 = C$
- Graphing a hyperbola given its equation in general form
- Finding the foci of a hyperbola given its equation in general form
- Writing an equation of a hyperbola given the foci and the vertices
- Writing an equation of a hyperbola given the foci and the asymptotes: Advanced
- Classifying conics given their equations

### Limits (10 topics, due on 06/16/2016)

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- Estimating a limit numerically
- Finding limits from a graph
- Finding a limit by using the limit laws: Problem type 1
- Finding limits for a piecewise-defined function
- Finding a limit by using the limit laws: Problem type 2
- Finding a limit by using the limit laws: Problem type 3
- Infinite limits and graphs
- Limits at infinity and graphs
- Limits at infinity and rational functions
- Infinite limits and rational functions