MATH 103 - College Algebra

ONLINE

Course Title and Number, Credits: MATH 103 College Algebra, 4 credits

Prerequisite: MATH 102 Intermediate Algebra, designated math placement test score, or instructor approval.

Course Description: Linear and quadratic equations, radicals, exponents and logarithms, rational expressions, systems of linear equations, functional notation, graphing sequences, and series.

Course Objectives: Students will learn techniques for solving problems related to the topics above. Students will develop ideas and methods for applying techniques to find solutions or resolutions to questions requiring algebraic reasoning. A graphing calculator will be used in appropriate areas.

Instructor: Tracy Chisholm

> **Office: Thatcher 1105**
> **Phone: 701-228-5601**
> **E-mail:** Use online course email tool; if unable to access the online class, use campus email address - **tracy.chisholm@dakotacollege.edu**
> **Office Hours:** Use the eMail tool within the online course to communicate with the instructor. Course eMail messages will be checked daily, Monday through Friday.

Technical Problems: If you have a technical problem, contact the Distance Education office by calling 1-888-918-5623 (toll-free) or the Moodle help desk: 1-866-940-0065
Class Schedule: Online

Learning Environment: The course utilizes an online learning system called ALEKS. Through ALEKS, students will have access to worked out explanations, textbook lessons, and video demonstrations.

Required Text: *College Algebra e-Text 2nd Edition* by John W. Coburn with ALEKS access code; McGraw Hill Publishing

Graphing Calculator: preferably TI-83 or TI-84 series

Course Requirements:

The sequential nature of mathematics deems it necessary for students to participate in class on a regular basis. *Active participation in the course is paramount.* Active participation means regularly accessing the online learning environment (ALEKS), mastering module topics, and taking the weekly progress checks.

Learning Mode: Students will work in the MyPie area of the ALEKS learning system on topics to be mastered. The problems for each topic are linked to worked out explanations, e-textbook material, and video demonstrations. Work on MyPie topics constitutes 10% of the student's final grade and is calculated by the percent of topics mastered by "module due dates." There are 12 modules in the course.

Homework Assignments: There are 14 homework assignments located in ALEKS. These assignments can be done multiple times and the best scores will be used. This work constitutes 45% of the student's final grade.

Tests: Two *proctored* tests will be given: the midterm and final exams. These exams are comprehensive and constitute 45% of the student's final grade. Students are responsible for finding a suitable proctor. Proctors must be approved by the instructor. The process is found on the homepage of this course.

Outline of Course Content:

- Review of Basic Concepts and Skills
- Equations and Inequalities
- Relations, Functions, and Graphs
- Polynomial and Rational Functions
- Exponential and Logarithmic Functions
- Systems of Equations and Inequalities

Schedule:

Dates Covered	MyPie Modules
5/6/13 - 5/10/13	Module 1: R.1-4
31/11/5- 13/14/5	Module 2: R.5-6
5/15/13 - 5/18/13	Module 3: s1.1-1.4
5/19/13 - 5/24/13	Module 4: s 1.5-1.6

5/25/13 - 5/30/13   Module 5: s2.1-2.3
5/31/13 - 6/6/13   Module 6: s2.4-2.5
6/7/13 - 6/11/13   Module 7: s2.6-2.8
6/12/13 - 6/24/13   Module 8: s3.1-3.2
6/25/13 - 7/1/13   Module 9: s3.3-3.6
7/2/13 - 7/8/13   Module 10: s4.1-4.3
7/9/13 - 7/15/13   Module 11: s4.4-4.5
7/16/13 - 7/22/13   Module 12: s5.1, 5.3-5.4

Class Policies:

- Regular participation is expected.
- Learning activities and progress checks will occur in the ALEKS learning system and require Internet connectivity.
- Module topics are to be mastered by due dates posted on ALEKS course calendar. Students may work ahead.
- Homework is due weekly and must be submitted on or before the 11:59 PM CT on the designated dates.
- Students must find a test proctor and have the selection of the proctor approved by the instructor at least 2 weeks before both the midterm and final exam.
- Students must take the midterm and final exams in a proctored setting on the designated dates.
- Tests will be available for a limited period of time. The maximum time for the midterm is 1 hour and the maximum time for the final exam is 2 hours.
- During the midterm and final exams, students are not allowed to use books, notes, Internet resources, or other assistance.

General Education Goals/Objectives:

Goal 2: Demonstrates knowledge and application of technology.

- Objective 2: Uses electronic resources for course related assignments and information
    - Skill 1: Selects appropriate program on the graphing calculator to solve problems

Goal 3: Demonstrates the ability to convert, calculate, and analyze a variety of mathematical problems

- Objective 1: Utilizes mathematical equations to solve problems
    - Skill1: Solves equations and problems using the appropriate method
- Objective 2: Applies practical application of mathematics to everyday life
    - Skill3: Solves word problems

Relationship to Campus Theme:
The student will use algebra to solve application problems in nature, economics, science, psychology, etc. The graphing calculator will be used to represent solutions visually and to find answers to complex problems.

Evaluation:
Final grades are based on mastery of MyPie topics (10%), scores on homework (45%), and scores on comprehensive midterm and final exams (45%).

Grades are calculated using the scale below.

> A--90-100%
> B--80-89%
> C--70-79%
> D--60-69%
> F--59% or lower

Academic Integrity:

The academic community is operated on the basis of honesty, integrity and fair play. It is the expectation that all students, as members of the college community, adhere to the highest levels of academic integrity. This means that:

- Students are responsible for submitting their own work. Student work must not be plagiarized.
- Students must not work together on graded assignments without authorization from the instructor or get help from people, technological resources, textbooks, notes, etc. on examinations.

To learn how to avoid plagiarism in your work, review the website from Purdue University, Is It Plagiarism Yet?

Violations of academic principles such as cheating, plagiarism or other academic improprieties will be handled using the guidelines outlined in the Student Handbook on pages 18, 19, and 37.

Disabilities and Special Needs:

If you have a disability for which you need accommodation, contact the Learning Center to request disability support services: phone 701-228-5477 or toll-free 1-888-918-5623.

ALEKS® Course Syllabus

Module 1: R.1-4 (40 topics, due on 5/10/13)

- Rational and irrational numbers
- Exponents and integers: Problem type 1
- Exponents and integers: Problem type 2
- Exponents and order of operations
- Signed fraction addition: Basic
- Signed fraction multiplication: Advanced
- Properties of real numbers
- Evaluating a linear expression in two variables
- Evaluating a quadratic expression in one variable
- Combining like terms: Advanced
- Degree and leading coefficient of a polynomial in one variable
- Simplifying a sum or difference of two univariate polynomials
- Multiplying a monomial and a polynomial: Univariate with positive leading coefficients
- Multiplying binomials with leading coefficients of 1
- Squaring a binomial: Univariate
- Multiplying conjugate binomials: Univariate
- Multiplying binomials in two variables
- Multiplication involving binomials and trinomials in two variables
- Evaluating expressions with exponents of zero
- Evaluating numbers with negative exponents
- Introduction to the product rule of exponents
- Product rule with positive exponents
- Quotients of expressions involving exponents
- Quotient rule with negative exponents: Problem type 1
- Introduction to the power rule of exponents
- Power rule with positive exponents
- Power rule with negative exponents: Problem type 1
- Power rule with negative exponents: Problem type 2
- Using the power and product rules to simplify expressions with positive exponents
- Converting between decimal numbers and numbers written in scientific notation
- Factoring a quadratic with leading coefficient 1
- Factoring a quadratic with leading coefficient greater than 1
- Factoring a difference of squares

- Factoring a sum or difference of two cubes
- Factoring out a monomial from a polynomial: Univariate
- Factoring a product of a quadratic trinomial and a monomial
- Factoring a polynomial by grouping: Problem type 2
- Complex fractions without variables: Problem type 2
- Product rule with negative exponents
- Factoring a multivariate polynomial by grouping: Problem type 1

Module 2: R.5-6 (35 topics, due on 5/14/2013)

- Least common multiple of two monomials
- Adding rational expressions with common denominators
- Adding rational expressions with different denominators: Multivariate
- Adding rational expressions with different denominators: ax, bx
- Adding rational expressions with different denominators: x+a, x+b
- Adding rational expressions with different denominators: Quadratic
- Simplifying a ratio of polynomials: Problem type 1
- Simplifying a ratio of polynomials: Problem type 2
- Multiplying rational expressions: Problem type 1
- Multiplying rational expressions: Problem type 2
- Dividing rational expressions: Problem type 1
- Complex fraction: Problem type 3
- Complex fraction: Problem type 4
- Cube root of an integer
- Square root simplification
- Square root of a perfect square monomial
- Simplifying a radical expression: Problem type 1
- Simplifying a radical expression: Problem type 2
- Square root addition
- Simplifying a sum of radical expressions
- Square root multiplication
- Simplifying a product of radical expressions
- Simplifying a product of radical expressions using the distributive property
- Special products with square roots: Conjugates and squaring
- Rationalizing the denominator of a radical expression
- Rationalizing the denominator of a radical expression using conjugates
- Simplifying a higher radical: Problem type 1
- Simplifying a higher radical: Problem type 2
- Rational exponents: Basic
- Rational exponents: Negative exponents and fractional bases
- Rational exponents: Products and quotients
- Rational exponents: Powers of powers
- Converting between radical form and exponent form
- Simplifying products or quotients of higher index radicals with different indices
- Pythagorean Theorem

Module 3: s1.1-1.4 (25 topics, due on 5/18/2013)

- 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: Fractional forms with binomial numerators
- Solving equations with zero, one, or infinitely many solutions
- Simple absolute value equation
- Solving an equation involving absolute value: Basic
- Algebraic symbol manipulation: Problem type 1
- Algebraic symbol manipulation: Problem type 2
- Solving a value mixture problem using a linear equation
- Solving a distance, rate, time problem using a linear equation
- Solving a linear inequality: Problem type 2
- Solving a linear inequality: Problem type 3
- Solving a linear inequality: Problem type 4
- Solving a compound linear inequality: Problem type 1
- Solving an inequality involving absolute value: Basic
- Solving an inequality involving absolute value
- Word problem with linear inequalities: Problem type 1
- Set builder and interval notation
- Union and intersection of finite sets
- Using i to rewrite square roots of negative numbers
- Simplifying a product or quotient involving roots of negative numbers
- Adding and subtracting complex numbers
- Multiplying complex numbers
- Dividing complex numbers
- Simplifying a power of i

Module 4: s 1.5-1.6 (25 topics, due on 5/24/2013)

- Finding the perimeter or area of a rectangle given one of these values
- Solving a rational equation that simplifies to a linear equation: Problem type 1
- Solving a rational equation that simplifies to a linear equation: Problem type 2
- Solving a rational equation that simplifies to a linear equation: Problem type 3
- Solving a rational equation that simplifies to a linear equation: Problem type 4
- Solving a word problem using a rational equation
- Solving a radical equation that simplifies to a linear equation: One radical
- Solving a radical equation that simplifies to a quadratic equation: One radical
- Solving a radical equation that simplifies to a quadratic equation: Two radicals
- Solving an equation with positive rational exponent
- 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 rational equation that simplifies to a quadratic equation: Problem type 1
- Solving a rational equation that simplifies to a quadratic equation: Problem type 2
- Solving a rational equation that simplifies to a quadratic equation: Problem type 3
- Solving a quadratic equation using the square root property: Problem type 1
- Solving a quadratic equation using the square root property: Problem type 2
- Completing the square
- Solving a quadratic equation by completing the square
- Applying the quadratic formula: Exact answers
- Discriminant of a quadratic equation
- Discriminant of a quadratic equation with parameter
- Solving a word problem using a quadratic equation with rational roots
- Solving a quadratic equation with complex roots

Module 5: s2.1-2.3 (20 topics, due on 5/30/2013)

- 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
- 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
- Writing the equations of vertical and horizontal lines through a given point
- Slopes of parallel and perpendicular lines: Problem type 1
- Slopes of parallel and perpendicular lines: Problem type 2
- Midpoint of a line segment in the plane
- Distance between two points in the plane
- Graphing a circle given its equation in standard form
- Graphing a circle given its equation in general form
- 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

Module 6: s2.4-2.5 (15 topics, due on 6/6/2013)

- Identifying functions from relations
- Vertical line test
- Evaluating functions: Problem type 1
- Variable expressions as inputs of functions
- Domain and range from ordered pairs
- Domain of a square root function
- Domain of a rational function
- Finding the domain of a fractional function involving radicals

- Interpreting the graphs of two functions
- Finding inputs and outputs of a function from its graph
- Finding intercepts and zeros of a function given the graph
- Finding where a function is increasing, decreasing, or constant given the graph
- Finding local maxima and minima of a function given the graph
- Domain and range from the graph of a continuous function
- Even and odd functions

Module 7: s2.6-2.8 (20 topics, due on 6/11/2013)

- 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
- Transforming the graph of a function using more than one transformation
- Graphing a parabola of the form $y = ax^2$
- Graphing a simple cubic function
- Graphing a function involving a square root
- Graphing an equation involving absolute value in the plane: Advanced
- Graphing a piecewise-defined function
- Sum, difference, and product of two functions
- Quotient of two functions
- Combining functions: Advanced
- Composition of two functions: Basic
- Composition of two functions: Advanced
- Graphing a parabola of the form $y = (x-a)^2 + c$
- Classifying the graph of a function
- How the leading coefficient affects the shape of a parabola

Module 8: s3.1-3.2 (14 topics, due on 6/24/2013)

- Solving a word problem using a quadratic equation with irrational roots
- Finding the maximum or minimum of a quadratic function
- Word problem using the maximum or minimum of a quadratic function
- Finding the x-intercept(s) and the vertex of a parabola
- Rewriting a quadratic function to find the vertex of its graph
- Using a graphing calculator to find the vertex and x-intercepts of a quadratic function
- Graphing a parabola of the form $y = ax^2 + bx + c$: Integer coefficients
- Writing the equation of a quadratic function given its graph
- Polynomial long division: Problem type 3
- Synthetic division
- Using the remainder theorem to evaluate a polynomial
- The Factor Theorem
- Finding a polynomial of a given degree with given zeros: Real zeros

- Using a given zero to write a polynomial as a product of linear factors: Real zeros

Module 9: s3.3-3.6 (15 topics, due on 7/1/2013)

- Finding zeros of a polynomial function written in factored form
- Finding all possible rational zeros using the rational zeros theorem: Problem type 1
- Descartes' Rule of Signs
- Using the rational zeros theorem to find all zeros of a polynomial: Rational zeros
- Multiplying expressions involving complex conjugates
- Finding a polynomial of a given degree with given zeros: Complex zeros
- Finding x- and y-intercepts given a polynomial function
- Determining the end behavior of the graph of a polynomial function
- Using a graphing calculator to find zeros of a polynomial function
- Using a graphing calculator to find local extrema of a polynomial function
- Matching graphs with polynomial functions
- Finding the asymptotes of a rational function: Problem type 1
- Sketching the graph of a rational function: Problem type 1
- Sketching the graph of a rational function: Problem type 2
- Matching graphs with rational functions: Two vertical asymptotes

Module 10: s4.1-4.3 (15 topics, due on 7/8/2013)

- Horizontal line test
- Determining whether two functions are inverses of each other
- Inverse functions: Problem type 1
- Evaluating an exponential function that models a real-world situation
- Converting between logarithmic and exponential equations
- Converting between natural logarithmic and exponential equations
- Evaluating a logarithmic expression
- Solving an exponential equation: Problem type 2
- Using a graphing calculator to solve an exponential or logarithmic equation
- Sketching the graph of an exponential function: Basic
- The graph, domain, and range of an exponential function
- Sketching the graph of a logarithmic function: Basic
- The graph, domain, and range of a logarithmic function
- Domain of a logarithmic function: Advanced
- Translating the graph of a logarithmic or exponential function

Module 11: s4.4-4.5 (15 topics, due on 7/15/2013)

- Basic properties of logarithms
- Writing expressions as a single logarithm
- Expanding a logarithmic expression: Problem type 1
- Expanding a logarithmic expression: Problem type 2
- Change of base for logarithms: Problem type 1
- Solving a logarithmic equation: Problem type 1

- Solving a logarithmic equation: Problem type 2
- Solving a logarithmic equation: Problem type 3
- Solving a logarithmic equation: Problem type 4
- Solving a logarithmic equation: Problem type 5
- Solving an exponential equation: Problem type 1
- Solving an exponential equation: Problem type 3
- Solving an exponential equation: Problem type 4
- Solving a word problem using an exponential equation: Problem type 2
- Compound interest

Module 12: s5.1, 5.3-5.4 (15 topics, due on 7/22/2013)

- Identifying solutions to linear equations in two variables
- Graphing a linear inequality in the plane: Standard form
- Graphing a linear inequality in the plane: Vertical or horizontal lines
- Graphing a linear inequality in the plane: Slope-intercept form
- Graphing a quadratic inequality: Problem type 1
- Classifying systems of linear equations from graphs
- Graphically solving a system of linear equations
- Solving a simple system using substitution
- Solving a system of linear equations using elimination with multiplication and addition
- Solving a system that is inconsistent or consistent dependent
- Solving a word problem involving a sum and another simple relationship using a system of linear equations
- Graphing a system of linear inequalities
- Solving a system of nonlinear equations
- Using a graphing calculator to solve a system of equations
- Graphing a system of nonlinear inequalities: Problem type 1