

**COMMON COURSE OUTLINE: Course discipline/number/title: MATH 1115: College Algebra**

**A. CATALOG DESCRIPTION**

**1. Credits: 3**

**2. Hours/Week: 3**

**3. Prerequisites (Course discipline/number):** Successful completion of MATH 0099 with grade of B or better recommended or MATH 0100 or appropriate score on RCTC placement test.

**4. Co-requisites (Course discipline/number):** None

**5. MnTC Goals (if any):** CT, MA

The first college level algebra course. Topics include but are not limited to: Polynomial, Rational, Radical, Exponential, and Logarithmic functions and their Inverses, solving and graphing higher order equations, optimization applications, methods of solving systems of equations, and conic sections.

**B. DATE LAST REVISED (Month, year):** March, 1999

**C. OUTLINE OF MAJOR CONTENT AREAS:**

1. Solving higher order equations and inequalities
2. Conic sections
3. Characteristics of Graphs (symmetry, translations, intercepts Min-Max, increasing, decreasing, turning points, asymptotes, and behavior)
4. Techniques of Graphing
5. Optimization applications
6. Functions-polynomial, rational, radical, exponential, logarithmic, and their inverses
7. Characteristics of Polynomial Functions
8. Methods of solving systems of equations
9. Algebra of Functions
10. Algebra of Complex numbers

**D. LEARNING OUTCOMES (GENERAL):** The student will be able to:

Master these skills:

1. Solving higher order equations and inequalities
  - a) Polynomials with rational roots (know techniques of division, long and synthetic, the rational root theorem, DesCartes Rule of sign, upper/lower bounds theorem, conjugate pair theorem, and factoring)
  - b) Non-linear inequalities by the use of the boundary point (sign graph) method.
  - c) Rational and fractional equations
  - d) Radical (rational exponents) equations
  - e) Exponential and logarithmic equations
2. Algebra of expressions
  - a) Simplify forms including polynomial, rational and fractional (including complex fractions), radical, complex, absolute value.
3. Techniques of graphing
  - a) Polynomials-(intercepts, turnaround points)
  - b) Rational functions (intercepts, vertical asymptotes, horizontal and oblique asymptotes)
  - c) Absolute value functions
  - d) Piecewise defined functions
  - e) Exponential and logarithmic functions (general shapes)
  - f) Conics
  - g) Lines as a review only (includes all forms such as point-slope, slope intercept, and standard form as well as the formulas and use of slope parallel and perpendicular, midpoint of a line segment, and distance.
  - h) Parabolas (vertex, focus, directrix, axis of symmetry, direction of opening), min/max theory and optimization techniques.
  - i) Circles (center, radius)
  - j) Ellipses (center, major/minor axes, foci)
  - k) Hyperbolas (center, asymptotes, foci, vertices) Translations, shifts, stretches, and compressions as applied to functions. Use of graphics calculator is generally introduced and included.

- D. LEARNING OUTCOMES (GENERAL):** The student will be able to:
4. Functions and Inverse functions
    - a) The student is expected to know functional notation, to understand the difference between functions and relations and find the domain and range of a function or relation, how to find inverse functions mathematically, sketch inverses, and know relationships of domains and range for functions and their inverses.
  5. Methods of solving systems of equations (linear and non-linear)
    - a) Included in linear systems of either two or three linear equations are techniques of substitution, elimination (or addition), and matrix methods (Gauss-Jordan elimination), An introduced technique is the matrix methods of Cramers Rule and the method of determinants. Included for non-linear systems are substitution and elimination.
  6. Algebra of Functions
    - a) The student is expected to know addition, subtraction, multiplication, division, and composition of functions and their notation as well as their sketches.
  7. Algebra of complex numbers
    - a) The student should know complex numbers and be able to relate complex numbers to the radicals with respect to addition, subtraction, multiplication, and division and also how to solve equations involving complex solutions.
  8. Proportionality
    - a) The student is expected to know how to read, setup and solve proportionality problems including direct, inverse, square, and joint.
- E. LEARNING OUTCOMES (MNTC):** Competencies from the Minnesota Transfer Curriculum (MNTC):
- Goal 2: Critical Thinking (CT): The student will be able to:
1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
  2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives, which can give alternative meanings or solutions to given situations or problems.
  3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.
  4. Recognize and articulate the value assumptions, which underlie and affect decisions, interpretations, analyses, and evaluations made by ourselves and others.
- Goal 4: Mathematics/Symbolic Systems (MA): The student will be able to:
1. Illustrate historical and contemporary applications of mathematics/logical systems.
  2. Clearly express mathematical/logical ideas in writing.
  3. Explain what constitutes a valid mathematical/logical argument (proof).
  4. Apply higher-order problem solving and/or modeling strategies.
- F. METHODS FOR EVALUATION OF STUDENT LEARNING:**
1. Tests
  2. Quizzes
  3. Homework
  4. Group assignments
  5. Comprehensive Final Exam
- G. SPECIAL INFORMATION (if any):** None