

Effective Fall 2018, 201920

Required Syllabus Information – all must be included in the course syllabus

MAT 121

Credits: 4

Long Title: College Algebra: GT-MA1

Course Description: Focuses on a variety of functions and the exploration of their graphs. Topics include: equations and inequalities, operations on functions, exponential and logarithmic functions, linear and non-linear systems, and an introduction to conic sections. This course provides essential skills for Science, Technology, Engineering, and Math (STEM) pathways.

Guaranteed Transfer (GT) Pathways Course Statement:

The Colorado Commission on Higher Education has approved MAT 121 for inclusion in the Guaranteed Transfer (GT) Pathways program in the GT- MA1 category. For transferring students, successful completion with a minimum C– grade guarantees transfer and application of credit in this GT Pathways category. For more information on the GT Pathways program, go to [CDHE GT Pathways Information](#).

MATHEMATICS CONTENT CRITERIA GT-MA1

- a) Demonstrate good problem-solving habits, including:
 - Estimating solutions and recognizing unreasonable results.
 - Considering a variety of approaches to a given problem, and selecting one that is appropriate.
 - Interpreting solutions correctly.
- b) Generate and interpret symbolic, graphical, numerical, and verbal (written or oral) representations of mathematical ideas.
- c) Communicate mathematical ideas in written and/or oral form using appropriate mathematical language, notation, and style.
- d) Apply mathematical concepts, procedures, and techniques appropriate to the course.
- e) Recognize and apply patterns or mathematical structure.
- f) Utilize and integrate appropriate technology.

COMPETENCIES & STUDENT LEARNING OUTCOMES FOR GT-MA1

Quantitative Literacy:

- 1. Interpret Information**
 - a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- 2. Represent Information**
 - a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- 3. Perform Calculations**
 - a. Solve problems or equations at the appropriate course level.
 - b. Use appropriate mathematical notation.
 - c. Solve a variety of different problem types that involve a multi-step solution and address the validity of the results.
- 4. Apply and Analyze Information**

- a. Make use of graphical objects (such as graphs of equations in two or three variables, histograms, scatterplots of bivariate data, geometrical figures, etc.) to supplement a solution to a typical problem at the appropriate level.
 - b. Formulate, organize, and articulate solutions to theoretical and application problems at the appropriate course level.
 - c. Make judgments based on mathematical analysis appropriate to the course level.
- 5. Communicate Using Mathematical Forms**
- a. Express mathematical analysis symbolically, graphically, and in written language that clarifies/justifies/summarizes reasoning (may also include oral communication).

SYSTEM REQUIREMENTS:

REQUIRED COURSE LEARNING OUTCOMES

1. Identify properties of functions including domain, range, increasing and decreasing.
2. Apply function notation.
3. Determine the inverse of a function.
4. Examine functions algebraically.
5. Analyze behavior and roots of polynomial functions.
6. Solve polynomial, rational and absolute value equations and inequalities.
7. Analyze polynomial, exponential, logarithmic and rational functions.
8. Create graphs of polynomial, exponential, logarithmic and rational functions.
9. Solve exponential and logarithmic equations.
10. Analyze piecewise functions.
11. Graph parent functions and their transformations.
12. Utilize algebraic techniques to solve application problems.
13. Solve systems of equations.
14. Classify conic sections.

REQUIRED TOPICAL OUTLINE

The required topical outline information **MUST** be included in the syllabi. It may be incorporated using one of the following variations: copying the topical outline as written below, integrating the topics within the assignment schedule, or listing the topics to be covered.

- I. Functions including domain, range, increasing and decreasing
 - a. Definition of a function
 - b. Identifying functions given table, graph or equation form
 - c. Domain and range of algebraic functions
 - d. Even and odd functions
 - e. Introduction to where functions are increasing and decreasing using a graph
 - f. Introduction to maxima and minima using a graph
- II. Function notation
 - a. Functions expressed using function notation
 - b. Evaluation of function notation from equations and graphs
- III. Inverse of a function
 - a. Notation of an inverse function
 - b. Definition of one-to-one functions
 - c. Algebraic determination of the inverse of a function

- d. Graphical properties of an inverse function
 - e. Domain and range of an inverse function
- IV. Function composition algebraically
 - a. Sum difference, product, quotient of functions
 - b. Composition notation
 - c. Inverses using composition
 - d. Composition of two functions
- V. Behavior and roots of polynomial functions
 - a. End behavior of polynomial functions
 - b. Division of polynomials
 - c. Polynomials as a product of linear factors
 - d. Multiplicity of zeros
 - e. Complex zeros
- VI. Polynomial, rational and absolute value equations and inequalities
 - a. Completing the square to find the vertex form of a quadratic function
 - b. Absolute value inequalities
 - c. Polynomial and rational inequalities using test intervals (critical values, number lines)
- VII. Analysis of polynomial, exponential, logarithmic and rational functions
 - a. Intercepts and End behavior
 - b. Zeros
 - c. Definition of exponential and logarithmic functions
 - d. Domain and range
 - e. Evaluation of exponential and logarithmic expressions
 - f. Introduction to the number e
 - g. Equations of asymptotes
- VIII. Graphs of polynomial, exponential, logarithmic and rational functions
 - a. Intercepts and end behavior
 - b. Asymptotes of functions from the equation and from the graph
- IX. Solutions of exponential and logarithmic equations
 - a. Conversion between exponential and logarithmic form
 - b. Properties of logarithms
 - c. Logarithmic equations
 - d. Extraneous solutions
 - e. Exponential equations
- X. Piecewise functions
 - a. Notation for piecewise functions
 - b. Evaluation of piecewise functions
 - c. Graphs of piecewise functions
 - d. Domain of piecewise functions
- XI. Parent functions and their transformations
 - a. Parent (also called base/toolbox) functions
 - b. Rigid transformations (horizontal/vertical translations and reflections)
 - c. Non-rigid transformations (horizontal/vertical scaling)
- XII. Algebraic techniques to solve application problems
 - a. Quadratic models including optimization
 - b. Exponential/logarithmic models
- XIII. Systems of equations
 - a. Methods for solving systems with three variables or more

- b. Systems of non-linear equations with two variables
- XIV. Conic sections
 - a. Circle
 - b. Parabola
 - c. Ellipse
 - d. Hyperbola

RECOMMENDED TOPICAL OUTLINE

- I. Function notation
 - a. Difference quotient
- II. Function composition algebraically
 - a. Domain of a composite function
 - b. Decomposition of a function
- III. Behavior and roots of polynomial functions
 - a. The Rational Root Theorem
 - b. The Remainder Theorem and the Factor Theorem
- IV. Polynomial, rational and absolute value equations and inequalities
 - a. Methods of solving quadratic equations
 - b. Solving equations reducible to quadratic form using substitutions
 - c. Review of solving rational equations
- V. Graphs of exponential, logarithmic and rational functions
 - a. Identifying the removable discontinuities of a rational function
 - b. Determining if a graph crosses horizontal asymptotes
 - c. Exponential and logarithmic equations
 - d. Change of base formula
- VI. Algebraic techniques to solve application problems
 - a. Direct and inverse variation
- VII. Systems of equations
 - a. Types of solutions (consistent, inconsistent, independent and dependent)
- VIII. Conic sections
 - a. Analysis of the properties of conic sections

Syllabi requirements, including legal compliance information must be included. Individual College syllabi guidelines may include additional information. Please contact your VPI/CAO for specific College requirements.