

College Algebra Guidelines

These guidelines represent the recommendations of the MAA/CUPM subcommittee, Curriculum Renewal Across the First Two Years, concerning the nature of the college algebra course that can serve as a terminal course as well as a pre-requisite to courses such as pre-calculus, statistics, business calculus, finite mathematics, and mathematics for elementary education majors. They were endorsed on January 31, 2007 by CUPM, the Committee on the Undergraduate Program in Mathematics.

Fundamental Experience

College Algebra provides students a college level academic experience that emphasizes the use of algebra and functions in problem solving and modeling, provides a foundation in quantitative literacy, supplies the algebra and other mathematics needed in partner disciplines, and helps meet quantitative needs in, and outside of, academia. Students address problems presented as real world situations by creating and interpreting mathematical models. Solutions to the problems are formulated, validated, and analyzed using mental, paper and pencil, algebraic, and technology-based techniques as appropriate.

Course Goals

- Involve students in a meaningful and positive, intellectually engaging, mathematical experience;
- Provide students with opportunities to analyze, synthesize, and work collaboratively on explorations and reports;
- Develop students' logical reasoning skills needed by informed and productive citizens;
- Strengthen students' algebraic and quantitative abilities useful in the study of other disciplines;
- Develop students' mastery of those algebraic techniques necessary for problem-solving and mathematical modeling;
- Improve students' ability to communicate mathematical ideas clearly in oral and written form;
- Develop students' competence and confidence in their problem-solving ability;
- Develop students' ability to use technology for understanding and doing mathematics;
- Enable and encourage students to take additional coursework in the mathematical sciences.

Competencies

1. Problem Solving

Goals for students include

- solving problems presented in the context of real world situations with emphasis on model creation and interpretation;
- developing a personal framework of problem solving techniques (e.g., read the problem at least twice; define variables; sketch and label a diagram; list what is given; restate the question asked; identify variables and parameters; use analytical, numerical and graphical solution methods as appropriate; determine plausibility of and interpret solutions);
- creating, interpreting, and revising models and solutions of problems.

2. Functions and Equations

Goals for the students include

- understanding the concepts of function and rate of change;
- effectively using multiple perspectives (symbolic, numeric, graphic, and verbal) to explore elementary functions;
- investigating linear, exponential, power, polynomial, logarithmic, and periodic functions, as appropriate;
- recognizing and using standard transformations such as translations and dilations with graphs of elementary functions;
- using systems of equations to model real world situations;
- solving systems of equations using a variety of methods;
- mastering algebraic techniques and manipulations necessary for problem-solving and modeling in this course.

3. Data Analysis

Goals for the students include

- collecting (in scientific discovery or activities, or from the Internet, textbooks, or periodicals), displaying, summarizing, and interpreting data in various forms;
- applying algebraic transformations to linearize data for analysis;
- fitting an appropriate curve to a scatter plot and use the resulting function for prediction and analysis;
- determining the appropriateness of a model via scientific reasoning.

Emphasis in Pedagogy

Goals for the instructor include

- facilitating the development of students' competence and confidence in their problem-solving abilities;
- utilizing and developing algebraic techniques as needed in the context of solving problems;
- emphasizing the development of conceptual understanding of the mathematics by the students
- facilitating the improvement of students' written and oral mathematical communication skills;
- providing a classroom atmosphere that is conducive to exploratory learning, risk-taking, and perseverance;
- providing student-centered, activity-based instruction, including small group activities and projects;
- using technology (computer, calculator, spreadsheet, computer algebra system) appropriately as a tool in problem-solving and exploration;
- conducting ongoing assessment activities designed to determine when mid-course adjustments are warranted.

Assessment

- Assessment tools will measure students' attainment of course competencies, including:
 - solving problems and interpreting results using algebraic tools;
 - building and interpreting models and predicting results;
 - communicating processes and solutions orally and in writing;
 - making quantitative and algebraic arguments;
 - reading and interpreting data presented in various forms.
- Assessment tools will include
 - individual quizzes;
 - individual examinations;
 - additional activities or assignments, such as
 - individual or group homework, projects, and activities;
 - individual or group oral presentations;
 - portfolios that demonstrate student growth;
 - group quizzes and exams.
- The course will be assessed by analyzing its effectiveness in:
 - facilitating student achievement of the course competencies;
 - positively affecting student attitudes about mathematics;
 - preparing students for subsequent courses in mathematics and mathematics-dependent disciplines;
 - preparing students for subsequent endeavors in and outside academia.