

.GEORGIA PERIMETER COLLEGE
MATHEMATICS ACADEMIC GROUP
COMMON COURSE OUTLINE

COURSE ABBREVIATION MATH 1111

CREDIT HOURS 3 semester hours

COURSE TITLE College Algebra

PREREQUISITES Placement into college-level mathematics

CATALOG DESCRIPTION

This course is a functional approach to algebra that incorporates the use of appropriate technology. Emphasis will be placed on the study of functions and their graphs, (linear, quadratic, piece-wise defined, rational, polynomial, exponential, and logarithmic functions) as well as inequalities. Systems of equations (linear and nonlinear) will be solved using matrices and/or algebraic techniques. Non-function parabolas and circles will be studied as shifted graphs. Appropriate applications will be included.

EXPECTED EDUCATIONAL RESULTS

As a result of completing this course, students will be able to:

1. Understand the definition of a function.
2. Determine the domain, range, and where a function is increasing, decreasing or constant for each type of function studied in the course.
3. Students will be able to interpret the slope and y-intercept of a line as an average rate of change and an initial amount, respectively. Students will be able to interpret and apply these ideas in applied settings.
4. **Model linear and non-linear functions from data. (REMOVE THIS)**
5. Graph transformations (vertical and horizontal shifts, vertical stretching and compressions, and reflections) of basic functions.
6. Graph quadratic functions of the form $y = a x^2 + b x + c$ by determining the vertex and intercepts. Students will be able to interpret and apply these ideas in applied settings.
7. Identify and graph power functions, transformations of power functions, and polynomial functions where the polynomial is factorable. Students will be able to describe the end behavior of polynomials and the relationship between end behavior and the degree of the polynomial. Students will be able to determine intercepts of factorable polynomials exactly. Students will be able to use technology to approximate x-intercepts and turning points of polynomials.
8. Identify and graph transformations of $y = 1/x$ and $y = 1/x^2$. Students will be able to recognize and determine vertical and horizontal asymptotes, end behavior, and behavior near vertical asymptotes.

9. Relate algebraic solutions to the following types of equations to the graphs of corresponding functions and applications:
 - a. Linear
 - b. Quadratic
 - c. Factorable polynomial
 - d. Rational
 - e. Radical (involving only one radical)
 - f. Equations of the form $x^n = k$
10. Graph piece-wise defined functions.
11. Students will be able to determine the symmetry of functions algebraically and graphically
12. Compose two functions and determine the domain of the composite function.
13. Define an inverse function, get a rule for an inverse function, and graph an inverse function.
14. Graph exponential functions of the form $y = a^x$ and their transformations. Students should also be able to graph the inverse function of $y = a^x$.
15. Solve simple exponential equations both graphically and using logarithms.
16. Apply exponential functions to problems involving exponential growth or decay.
17. Define a logarithm, convert between logarithmic and exponential form, and understand the inverse relationship between logarithmic and exponential functions.
18. Use properties of logarithms to solve logarithmic equations and use logarithms in application problems.
19. Use function graphs to determine solutions to the following types of inequalities and apply these solutions to concepts related to functions and other applications:
 - a. Linear
 - b. Quadratic
 - c. Factorable Polynomial
 - d. Rational
 - e. Exponential
20. Solve non-linear systems of equations analytically and graphically.
21. Solve linear systems of equations using Gaussian elimination and matrices.
22. Graph parabolas and circles whose equations are given in general form by completing the square.

GENERAL EDUCATION OUTCOMES

- I. This course addresses the general education outcome relating to communication by providing additional support as follows:
 - A. Students improve their listening skills by taking part in general class discussions and in small group activities.
 - B. Students improve their reading skills by reading and discussing the text and other materials. Reading mathematics requires skills somewhat different from those used in reading materials for other courses, and these are discussed in class.

- C. Unit tests, examinations, and other assignments provide opportunities for students to practice and improve mathematical writing skills. Mathematics has a specialized vocabulary that students are expected to use correctly.
- II. This course addresses the general education outcome of demonstrating effective individual and group problem-solving and critical skills as follows:
 - A. Students must apply mathematical concepts to non-template problems and situations.
 - B. In applications, students must analyze problems, often through the use of multiple representations, **develop or (Remove this) select an appropriate mathematical model, utilize the model,** and interpret results.
- III. This course addresses the general education outcome of using mathematical concepts to interpret, understand, and communicate quantitative data as follows:
 - A. Students must demonstrate proficiency in problem solving including applications of linear, quadratic, exponential, and logarithmic functions.
 - B. Students must be familiar with simple data analysis tools for building linear and non-linear models. (REMOVE)

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- III. This course addresses the general education outcome of using mathematical concepts to interpret, understand, and communicate quantitative data by demonstrating proficiency in problem solving including applications of linear, quadratic, exponential, and logarithmic functions.
- IV. This course addresses the general education outcome of organizing information through the use of computer software packages as follows:
 - A. Students are required to use a graphing calculator to graph functions, determine intercepts, and determine turning points of graphs.
 - B. Students will use simple data analysis tools for building linear and non-linear models. (REMOVE THIS)

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- IV. This course addresses the general education outcome of organizing information through the use of computer software packages by requiring the student to use a graphing calculator to graph functions, determine intercepts, and determine turning points of graphs.

COURSE CONTENT

1. Linear Functions
2. Quadratic Functions
3. Other Basic Functions.
4. Polynomial Functions
5. Rational Functions.

6. Composition and Inverse Functions
7. Exponential and Logarithmic Functions
8. Systems of Equations

ENTRY-LEVEL COMPETENCIES

Before enrolling in this course, the student is expected to be able to:

1. Use algebraic symbols and notation to make meaningful statements
2. Solve applications for which linear equations, quadratic equations, and systems are mathematical models
3. Solve the following equations algebraically:
 - a. Quadratic with real and non-real solutions
 - b. Absolute value of the form: $|ax + b| = \text{constant}$
 - c. Fractional leading to a quadratic
 - d. Polynomial of degree higher than two by factoring
 - e. Radical leading to linear or quadratic
4. Solve inequalities algebraically, write the solution set in interval notation, and graph the solution set on a number line for the following types of inequalities:
 - a. Factorable quadratic
 - b. $|ax + b| < \text{or } > \text{constant}$
 - c. Factorable polynomial of degree higher than two
5. Solve a system of two linear equations in two variables (having no, one, or many solutions) by graphing, substitution, or elimination
6. Perform operations with complex numbers (excluding division)
7. Apply properties of exponents with integral and rational exponents
8. Perform the four basic operations with radicals (excluding rationalizing)
9. Solve problems where students have to display comprehension of basic geometric concepts including the Pythagorean Theorem, formulas for area and perimeter of rectangles, squares, and triangles
10. Perform the following activities with lines:
 - a. Use the distance and midpoint formula
 - b. Graph equations in standard form and slope-intercept form
 - c. Compute the slope given two points
 - d. State the slope given an equation
 - e. State if lines are parallel or perpendicular from given information
 - f. Write the equation of a line given information
11. Use a graphing calculator
12. Understand function notation
13. Graph parabolas using a table of values and plotting points

ASSESSMENT OF EXPECTED EDUCATIONAL RESULTS

A. COURSE GRADE

The course grade will be determined by the individual instructor using a variety of evaluation methods. A portion of the course grade will be determined through the use of

frequent assessment using such means as tests, quizzes, projects, or homework as developed by the instructor. Some of these methods will require the student to demonstrate ability in problem solving and critical thinking as evidenced by explaining and interpreting solutions. A comprehensive final examination is required which must count at least one-fifth and no more than one-third of the course grade.

B. DEPARTMENTAL ASSESSMENT

This course will be assessed every three years. The next assessment will occur during spring semester, 2008. The assessment instrument will be administered as a portion of the final exam and will be administered in all sections of the course. The instrument will consist of ten to fifteen multiple-choice questions. Each of the eight course content areas and each of the General Education Outcomes addressed by the course will be measured by at least one exam question.

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This course will be regularly assessed in accordance with the GPC policies. The assessment instrument will be administered as a portion of the final exam or midterm or other appropriate methods determined by the course committee and will be administered in all sections of the course. The instrument should consist of ten to fifteen multiple-choice questions but this may vary according to the determination of the committee. Each of the course content areas and each of the General Education Outcomes addressed by the course should be measured by at least one exam question

C. USE OF ASSESSMENT FINDINGS

The Math 1111 committee, or a special assessment committee appointed by the Academic Group, will analyze the results of the assessment and determine implications for curriculum changes. An item analysis will be done for each exam question. If the mean success rate on any assessment item is below 60%, the committee will make a recommendation to address the area of weakness. The committee will prepare a report for the Academic Group summarizing its finding.

EFFECTIVE DATE: August 1, 2009 APPROVED DATE: May 2009