

Oakwood High School Honors Precalculus Course of Study
Initiated 2001-2002 School Year

**HONORS
PRECALCULUS**

COURSE OF STUDY

OAKWOOD BOARD OF EDUCATION

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Initiated 2001-2002 School Year

STATEMENT OF APPROVAL

This HONORS PRECALCULUS Course of Study
was approved by the
Board of Education
Oakwood City School District
Dayton, Ohio

June 11, 2001
Date



Superintendent



Board President

HONORS PRECALCULUS

Roman numeral headings indicate NCTM Standards for grades 9-12. A correlation between the course of study and the Ohio competencies for the revised (2000) twelfth grade proficiencies test for mathematics is included at the end of the course of study.

I. Numbers and Operations

- a. Students will be able to know the different systems of numbers, including whole numbers, integers, real and complex numbers, and understand when each is appropriate for giving the solution to a problem. This includes the understanding of whether a situation or function is discrete or continuous.
- b. Students will be able to perform mathematical operations on the above systems of numbers.
- c. Students will be able to make reasonable estimates, which includes deciding whether a problem calls for a rough estimate or a precise answer.
- d. Students will be able to recognize when estimation is an appropriate means of determining whether a solution or measurement is reasonable.
- e. Students will be able to know the effects of various operations such as multiplication, division, and computing powers and roots on the magnitudes of quantities.

II. Patterns, Functions, and Algebra

- a. Students will be able to identify and understand properties of linear, polynomial, exponential, rational, trigonometric, and logarithmic functions.
- b. Students will be able to model and solve problems with real world data using the above functions.
- c. Students will be able to combine, find inverses of and transformations for the above functions.
- d. Students will be able to use the graphing calculator to explore and discover patterns.
- e. Students will be able to identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships.
- f. Students will be able to draw reasonable conclusions about a situation being modeled.
- g. Students will be able to recognize and/or show when two forms of an expression are equivalent.
- h. Students will be able to find complex solutions symbolically and with the aid of technology.
- i. Students will be able to understand the basic concepts of limits.
- j. Students will be able to determine the value of a limit.

III. Geometry and Spatial Sense

- a. Students will be able to make connections with geometry to other strands of mathematics (e.g., measurement, algebra, and trigonometry), relate it to other areas of interest (e.g., art, architecture), and use it to solve problems.
- b. Students will have an understanding of right triangle definitions of trig functions, and be able to use those trig functions to solve problems.
- c. Students will be able to recognize and use trigonometric identities & formulas.
- d. Students will be able to represent and convert rectangular coordinates and complex numbers in the polar coordinate system.
- e. Students will be able to use vectors as a tool to represent directed quantities, and to perform operations with them.
- f. Students will know the properties of conic sections and will be able to identify the equation.

IV. Measurement

- a. Students will be able to apply concepts of perimeter, area, surface area, and volume in the context of real world problems.
- b. Students will be able to measure angles in degrees or radians and will be able to convert between the two units.
- c. Students will be able to apply trigonometric functions to determine distances and angles.

V. Data Analysis and Probability

- a. Students will be able to simulate real world phenomena as a way of making predictions and determining probability.
- b. Students will be able to apply the Fundamental Counting Principle to determine the number of ways a given event can occur.
- c. Students will be able to conduct simulations in a variety of ways, including using technology.

VI. Problem Solving

- a. Students will be able to build new mathematical knowledge through their work with problems.
- b. Students will be able to develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
- c. Students will be able to apply a wide variety of strategies to solve problems and adapt the strategies to new situations.
- d. Students will be able to monitor and reflect on their mathematical thinking in solving problems.

VII. Reasoning and Proof

- a. Students will be able to understand that the solution to a problem and the justification of that solution are equally important, and that a problem is not solved until it is justified.
- b. Students will be able to understand proportional reasoning and use it to solve problems.
- c. Students will be able to use examples and counterexamples in order to support and disprove conjectures. Furthermore, they will recognize that multiple examples do not constitute a proof, and that more formal reasoning is necessary to prove a conjecture.
- d. Students will be able to develop a variety of formal and informal types of reasoning skills, and recognize when each of these is appropriate.
- e. Students will be able to use the graphing calculator to make and verify conjectures about patterns.

VIII. Communication

- a. Students will be able to engage in mathematical discussions with one another. This includes not only contributing one's own ideas, but also carefully considering and making sense of the thinking and strategies of others.
- b. Students will be able to use the language of mathematics as a precise means of mathematical expression in their writing, discussions, and presentations.
- c. Students will be able to write coherently about their mathematical thinking for a variety of audiences, including peers, teachers, and those unfamiliar with the content of this course.

IX. Connections

- a. Students will be able to approach mathematics as a connected body of knowledge in which understanding is deepened as they see and work with relationships among mathematical concepts.
- b. Students will be able to recognize, use, and learn about the mathematical ideas that become necessary as they deal with various contexts.
- c. Students will be able to make connections among various areas of mathematics (e.g., geometry, measurement, algebra, and trigonometry).

X. Representations

- a. Students will be able to represent situations in multiple ways and understand the relationships among those representations. These representations could include graphs, tables, symbolic expressions, equations, inequalities, matrices, and diagrams.
- b. Students will be able to solve equations, including systems of equations, using the above representations.
- c. Students will be able to use a graphing calculator as a tool for modeling and solving real world problems.

STATE COMPETENCIES FOR REVISED (2000) TWELFTH GRADE PROFICIENCY TEST FOR MATHEMATICS

STUDENTS WILL:

Number and Numeracy

Competency in number and numeracy as measured by the High School Graduation Qualifying Examination and expectations appropriate for all students completing three units of high school level mathematics are very similar. Therefore, on the twelfth-grade proficiency test, number and numeracy will be assessed not as separate competencies, but as part of the following competencies.

Algebra and Functions

1. Represent and analyze functions using and translating among words, tables, graphs, and symbols. **(II)**
2. Solve equations and inequalities including, but not limited to, quadratic equations and systems of equations and/or inequalities. **(II)**
3. Model real-world situations using algebraic concepts and processes, and use models to predict trends and pose solutions. **(II and VI)**

Geometry and Measurement

4. Recognize, interrelate, and apply properties of two- and three-dimensional geometric objects. **(III and IV)**
5. Use visualization, spatial reasoning, coordinate systems, and transformations to represent and solve problems. **(II, III, and VI)**
6. Apply indirect measurement techniques including scale drawings, formulas, and geometric relationships to real-world contexts. **(III and IV)**

Data Analysis and Probability

7. Read, interpret, and use data as presented in tables, charts, and graphs to identify patterns, note trends, draw conclusions, and make predictions. **(V)**
8. Use descriptive statistics to summarize data including measures of center, dispersion, correlation, and variability. **(V)**
9. Analyze and evaluate statistical claims and arguments such as recognizing differences between correlation and causation and the appropriateness of sampling methods. **(V)**
10. Use experimental and theoretical probability, as appropriate, to represent and solve problems involving uncertainty. **(V and VI)**

Mathematical Processes

Contexts for items and tasks assessing mathematical processes will be drawn from the content associated with competencies 1-10. Competencies in number and numeracy as measured by the High School Graduation Qualifying Examination will also serve as contexts for items and tasks developed for competencies 11-14.

11. Develop or use algorithms or sequences of instructions to solve problems. **(VI and VII)**
12. Select and apply a variety of problem-solving strategies. **(VI)**
13. Justify conclusions using various types of reasoning. **(VII)**
14. Locate and interpret mathematical information accurately, and communicate ideas, processes, and solutions, applicable to the problem situation, in a complete and easily understood manner. **(VIII and IX)**