

## ADVANCED MATHEMATICS HONORS

Prerequisite: A grade of B or better in Algebra II (preferably Algebra II Honors) is strongly recommended  
Meeting time: 5 days a week, full year, one credit  
Placement: Grades 11, 12, Level II

## ADVANCED MATHEMATICS

Prerequisite: A grade of C+ or better in Algebra II is strongly recommended  
Meeting time: 5 days a week, full year, one credit  
Placement: Grades 11, 12, Level III

This course is intended for students who are capable of doing higher collegiate mathematics: those students who intend to further their education in the fields of mathematics or science, those who will need mathematics as a supporting tool in a chosen field, or those who enjoy mathematical reasoning. Due to the changing pattern in mathematics education in the past few years, the course has been kept flexible in order to include or update topics, not previously covered, but considered essential to further mathematics courses. A large portion of the course is devoted to basic calculus concepts and trigonometry. An introductory unit from finite mathematics makes up the remainder of the course for Advanced Mathematics, while the Advanced Mathematics Honors course explores the use of vectors and polar coordinates.

Advanced Math Honors extends the topics presented in Advanced Math and introduces additional concepts necessary for the study of Calculus. Those concepts which are unique to Advanced Math Honors are identified by an asterisk (\*)

(Agawam High School Academic Expectations: 1,3,4,5,6)

## COURSE GOALS AND OBJECTIVES

1. To utilize and integrate the student's background of arithmetic, algebra and geometry in clarifying new concepts or structures.
2. To stress the structure and underlying theorems of each mathematical unit.
3. To encourage the student to read with understanding and depth, including making searches into previous mathematics courses.
4. To emphasize the value and purpose of accepted mathematical symbolism and terminology.
5. To encourage the student to heed his/her intuition, and to check such intuitive thoughts using mathematical logic.
6. To provide many practice problems and a variety of applications so that the student's manipulative skills can be maintained and clarified.
7. To provide experiences which will encourage independence of choice and flexibility of method in the student.

### **Strand 1: Number Sense and Operations**

*NCTM Standard (State Standard)*

- Define complex number and operations on them, in particular, addition, subtraction, multiplication, and division. (PC.N.1)
- Relate the system of complex numbers to the system of real and rational numbers.(PC.N.1)
- Simplify numerical expression with powers and roots. (PC.N.1)

**Strand 2: Patterns, Relations, and Algebra**

*NCTM Standard (State Standard)*

- Perform operations on functions including composition. (AII.P.5)
- Find inverses of functions. (AII.P.5)
- Given algebraic, numeric and/or graphical representations, recognize functions as polynomial, rational, trigonometric and/or (\*) polar (PC.P.7)
- Solve a variety of inequalities using algebraic, graphical and numerical methods. (PC.P.7)
- Solve everyday problems that can be modeled using polynomial and rational functions. (PC.P.7)
- Apply appropriate graphical, tabular, or symbolic methods to the solution. (PC.P.7)
- Identify maximum and minimum values of functions in simple situations. (PC.P.7)
- Describe the translations and scale changes of a given function  $f(x)$  resulting from substitutions for the various parameters. (PC.P.6)
- Use limit theorems to evaluate the limit of a polynomial function. (12.P.12)
- Find the derivative of a function. (12.P.12)
- Use integration formulas (PC.P.1)
- Use the Fundamental Theorem of Calculus to evaluate definite integrals.
- Find solutions to quadratic equations (with real coefficients and real or complex roots) and apply to the solution of problems. (PC.P.2)
- Solve a variety of equations using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. (PC.P.2 and 12.P.8)
- Demonstrate an understanding of the trigonometric functions. (PC.P.3, PC.P.5 and PC.G.1)
- Solve everyday problems that can be modeled using trigonometric functions. (PC.P.2, PC.G.1 and PC.M.2)
- Use symbolic, numeric, and graphical methods (including matrices) to solve systems of equations. (12.P.9)
- \* Demonstrate an understanding of the exponential and logarithmic functions. (12.P.4)

**Strand 3: Geometry**  
*NCTM Standard (State Standard)*

- Relate geometric and algebraic representations of lines. (PC.P.7 and 12.G.4)
- Apply properties of tangents and secants to solve problems. (PC.G.3)
- Find the area between a curve and the  $x$ -axis by using the limit of areas of rectangles. (12.G.5)
- Apply the Law of Sines and Cosines. (PC.G.1)
- Apply properties of angles, arcs, and radii to solve problems. (PC.G.3)
- Derive and apply basic trigonometric identities. (PC.P.4 and PC.P.5)
- \* Use vectors to solve problems (PC.G.2)
- \* Describe addition of vectors and scalar multiplication both symbolically and pictorially. (PC.G.2)
- \* Use vector methods to obtain geometry results. (PC.G.2)

**Strand 4: Measurement**  
*NCTM Standard (State Standard)*

- Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, e.g., angular velocity and acceleration. (PC.M.1)

**RESOURCES**

Primary Textbook:

Gordon-Holliday, Berchie et al. Advanced Mathematical Concepts: Precalculus with Applications. New York; Glencoe/McGraw-Hill, 1999.

Teacher generated materials such as NCTM journals, note taking outlines, etc.

Technology Resources: Classroom sets of scientific and graphing calculators.

**ASSESSMENT STRATEGIES**

- Class participation, written and oral communication
- Class work
- Homework
- Class projects and presentations
- Notebooks/Portfolios
- Quizzes
- Tests
- Departmental Semester Exams
- School Wide and Departmental Rubrics