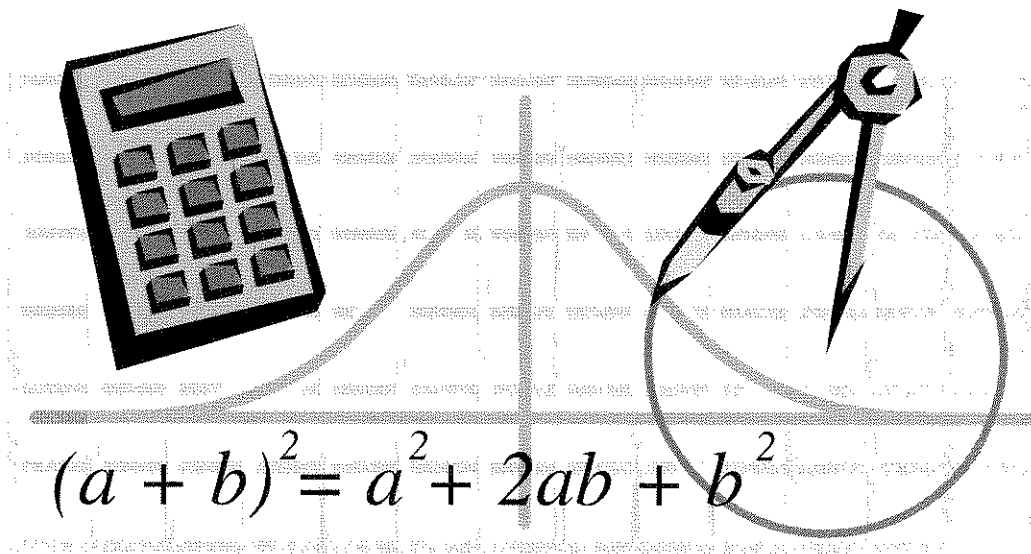


Atlantic City Public Schools
Analysis Pre-Calculus Honors
Grades 9 - 12



I. OVERVIEW

Analysis/Pre-Calculus Honors is a full year course that presents an in-depth examination of trigonometry, sequences, exponentials and logarithms, functions, analytic geometry, limits, and mathematical logic. Mathematical rigor is needed to be successful in this course. The intent is to study advanced mathematical topics while developing the student's ability to think abstractly.

II. RATIONALE

Analysis/Pre-Calculus Honors is designed to give college preparatory students the necessary background for Advanced Placement Calculus and post-calculus mathematics, while developing in the student an appreciation of the higher forms of math. This course should be considered a necessity for any pupil that hopes to pursue a science or mathematics related career.

III. STANDARDS

The Atlantic City Mathematics Program is aligned too the NJ Core Mathematics Content Standards. The standards are listed below.

- 4.1 All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways
 - A. Number Sense
 - B. Numerical Operations
 - C. Estimation

- 4.2 All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.
 - A. Geometric Properties
 - B. Transforming Shapes
 - C. Coordinate Geometry
 - D. Units of Measurement
 - E. Measuring Geometric Objects

- 4.3 All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.
 - A. Patterns and Relationships
 - B. Functions
 - C. Modeling
 - D. Procedures

- 4.4 All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them too model situations, solve problems, and analyze and draw appropriate inferences from data.
- A. Data Analysis (Statistics)
 - B. Probability
 - C. Discrete Mathematics-Systematic Listing and Counting
 - D. Discrete Mathematics-Vertex Edge Graphs and Algorithms
- 4.5 All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.
- A. Problem Solving
 - B. Communication
 - C. Connections
 - D. Reasoning
 - E. Representations
 - F. Technology

IV. Student Outcomes

A. KNOWLEDGE

1. Understand basic concepts of logical reasoning
2. Utilize truth tables to determine the truth of a given statement
3. Analyze the various methods used to create arguments using truth tables
4. Evaluate functions and find their domains.
[4.1A, 4.1B, 4.2C, 4.3B, 4.3C, 4.3D, 4.5A, 4.5B, 4.5C]
5. Analyze graphs of functions.
[4.1A, 4.2C, 4.3B, 4.3C, 4.5A]
6. Identify and graph shifts, reflections, and nonrigid transformations of functions.
[4.1A, 4.2C, 4.3B, 4.3C, 4.5A, 4.5D]
7. Find arithmetic combinations and compositions of functions.
[4.1A, 4.2B, 4.3A, 4.3B, 4.3C, 4.5A, 4.5C]

8. Find inverses of functions graphically and algebraically.
[4.2B, 4.3A, 4.3B, 4.3C, 4.5A, 4.5C]
9. Recognize, evaluate, and graph exponential and logarithmic functions.
[4.1A, 4.1B, 4.2A, 4.2C, 4.3A, 4.3B, 4.5A, 4.5B, 4.5E]
10. Rewrite logarithmic functions with different bases.
[4.1A, 4.2C, 4.3A, 4.3B, 4.5A, 4.5F]
11. Use properties of logarithms to evaluate, rewrite, expand, or condense logarithmic expressions.
[4.1A, 4.2A, 4.2C, 4.3A, 4.3B, 4.5A, 4.5D]
12. Solve exponential and logarithmic equations.
[4.1A, 4.2A, 4.2C, 4.3A, 4.3B, 4.3C, 4.5A, 4.5E]
13. Use exponential growth models, exponential decay models, Gaussian models, logistic models, and logarithmic models to solve real-life problems.
[4.3A, 4.3B, 4.3C, 4.3D, 4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
14. Fit exponential and logarithmic models to sets of data.
[4.3A, 4.3C, 4.5A, 4.5E, 4.5F]
15. Describe an angle and convert between degree and radian measures.
[4.2A, 4.2E, 4.3A, 4.3B, 4.5E, 4.5F]
16. Identify a unit circle and its relationship to real numbers.
[4.2A, 4.2E, 4.3A, 4.3B, 4.5E, 4.5F]
17. Evaluate trigonometric functions of angle.
[4.2A, 4.2C, 4.2E, 4.3A, 4.3B, 4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
18. Use fundamental trigonometric functions of any angle.
[4.1A, 4.2A, 4.2E, 4.3A, 4.3B, 4.5E]
19. Sketch graphs of trigonometric functions.
[4.2A, 4.2E, 4.3A, 4.3B, 4.3C, 4.3D, 4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
20. Evaluate inverse of trigonometric functions.
[4.2A, 4.3A, 4.3B, 4.3C, 4.4D, 4.5E, 4.5F]
21. Evaluate the composition of functions.
[4.1A, 4.3B, 4.3C, 4.5A, 4.5B, 4.5C, 4.5D, 4.5E, 4.5F]

22. Use trigonometric functions to model and solve real-life problems.
[4.2A, 4.3A, 4.3B, 4.3C, 4.3D, 4.5F]
23. Use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expression.
[4.2A, 4.3A, 4.3B, 4.5D, 4.5E]
24. Verify trigonometric identities.
[4.1A, 4.2A, 4.2E, 4.3A, 4.3B, 4.5B, 4.5E]
25. Use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations.
[4.2A, 4.2E, 4.3A, 4.3B, 4.5A, 4.5C, 4.5F]
26. Use sum and difference formulas, multiple-angle formulas, power-reducing formulas, half-angle formulas, and product-sum formulas to rewrite and evaluate trigonometric functions.
[4.1B, 4.2A, 4.5A, 4.5B, 4.5C, 4.5D]
27. Use the Law of Sines and the Law of Cosines to solve oblique triangles.
[4.1B, 4.2A, 4.3A, 4.3B, 4.5A]
28. Find areas of oblique triangles.
[4.1B, 4.2A, 4.2E, 4.3A, 4.3B, 4.5A, 4.5C]
29. Use sequence, factorial, and summation notation to write the terms and sums of sequences.
[4.1A, 4.1B, 4.3A, 4.5A, 4.5E]
30. Recognize, write, and use arithmetic sequences and geometric sequences.
[4.1A, 4.1B, 4.3A, 4.5A, 4.5D, 4.5E]
31. Use mathematical induction to prove statements involving a positive integer n .
[4.1A, 4.3A, 4.5A, 4.5D]
32. Use the Binomial Theorem and Pascal's Triangle to calculate binomial coefficients and write binomial expansions.
[4.1A, 4.3A, 4.3B, 4.3C, 4.5A, 4.5C, 4.5D]
33. Solve counting problems using the Fundamental Counting Principle, permutations, and combinations.
[4.1A, 4.4B, 4.4C, 4.5A, 4.5D, 4.5E]

34. Find the probability of events and their complements.
[4.1A, 4.4B, 4.4C, 4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
35. Estimate limits and use properties and operations of limits.
[4.1A, 4.3A, 4.5A, 4.5D]
36. Find limits by direct substitution and by using the dividing out and rationalizing techniques.
[4.1A, 4.3A, 4.3D, 4.5A, 4.5D]
37. Appropriate slopes of tangent lines, use the limit definition of slope, and use derivatives to find slope of graphs.
[4.2A, 4.2B, 4.3A, 4.3B, 4.5A, 4.5D, 4.5E]
38. Evaluate limits at infinity and find limits of sequences.
[4.1A, 4.3A, 4.3B, 4.5A, 4.5D, 4.5E]
39. Find limits of summations and use them to find areas of regions bounded by graphs of functions.
[4.1A, 4.2A, 4.2C, 4.3A, 4.3B, 4.5A, 4.5D, 4.5E]

B. Attitudes

The student will:

1. develop a desire to pursue the study of mathematics in the future.
[4.5A, 4.5C]
2. develop an understanding and appreciation for the application of mathematics in real life situations and its relationship to other disciplines.
[4.5B, 4.5C, 4.2D, 4.3C]
3. develop a desire to persist and solve mathematical problems from beginning to end.
[4.5A]
4. develop an appreciation for the history of mathematics
[4.5C]
5. develop an appreciation for mathematics as an integrated whole.
[4.5C, 4.3D]

C. CLASSROOM EXPECTATIONS

The student will:

1. develop pride in and a feeling of self worth.
2. develop a respect and be active in the learning process.
3. learn to respect those that think, dress, and act differently.
4. encourage and nurture academic achievement through high expectations.
5. promote an appreciation for the strengths of cultural diversity.
6. be prepared to learn on a daily basis.

D. SKILLS AND BEHAVIORS

The student will:

1. develop and apply various strategies to solve problems from everyday and mathematics situations as well as career-based problems.
[4.5A, 4.5B, 4.5C, 4.5E, 4.5F, 4.2D, 3.2D, 4.3C, 4.4D]
2. develop the ability to communicate mathematically through a variety of forms of expression including oral, written, and visual.
[4.5A, 4.5B, 4.5C, 4.5D, 4.5E]
3. use physical models and manipulatives to model and investigate problem situations and mathematics concepts.
[4.5A, 4.5E, 4.5F]
4. use calculators and other appropriate forms of technology to gather, analyze, and display mathematical data, and to facilitate and enhance their mathematical thinking, understanding, and power.
[4.5A, 4.5B, 4.5C, 4.5E, 4.5F, 4.1C, 4.1B, 4.2B, 4.4A]
5. demonstrate organization by keeping a complete and detailed notebook.
6. work independently and in cooperative groups to enhance mathematical thinking.
[4.5A, 4.5A, 4.5B, 4.5D]
7. recognize that there may be multiple ways to solve a problem, weigh their relative merits, and select and use appropriate problem solving strategies.
[4.5A, 4.5B, 4.5E, 4.5F, 4.1C, 4.2D, 4.3D]

8. reflect on and clarify their thinking so as to present convincing arguments for their conclusions.
[4.5A, 4.5B, 4.5D, 4.5E]

E. TECHNOLOGICAL LITERACY

The student will:

1. demonstrate the ability to enter data, use mathematical or logical functions to manipulate data, to generate charts and graphs, and to interpret the results [8.12.1.A.3]
2. exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse [8.12.1.B.2]
3. understand the nature and impact of technology as well as its costs and trade-offs in terms of productivity [8.12.2.A.1, 8.12.2.A.2, 8.12.2.A.3]

F. CAREER EDUCATION AND CONSUMER, FAMILY, AND LIFE SKILLS

The student will:

1. understand the necessary pathways for entering the world of work as well as continuing education, such as college, post-secondary vocational-technical education, specialized certification and/or registered apprenticeships [9.1.A.1, 9.1.A.2, 9.1.A.3, 9.1.A.4]
2. understand the importance of mathematics and how to use mathematics in order to be functional members of society.
[9.2.12.A.1, 9.2.12.A, 9.2.12.A.4, 9.2.12.C.1, 9.2.12.E]

V. STRATEGIES

In Pre-Calculus instructional strategies used offer a balanced approach to the study of functions. Students will investigate and represent functions symbolically and graphically, making connections between the various methods of representation.

Students use writing as a mechanism to communicate their understanding of a concept. Writing will be used on tests with responses to open-ended questions, in homework assignments and/or long-term projects. Instruction will be given as to the criteria used to assess student writing so that students may be better able to evaluate their own work.

The focus of all strategies and methods will be to foster the development of the student's ability to think logically and communicate clearly. Appropriate classroom time will be given to all students to:

- work independently, work in pairs, and work in cooperative groups
- use the language and symbols of mathematics to communicate and discuss solution verbally and in writing
- present original work to other students and receive critiques of their work; to critique the work of other students

Graphing calculators are a required tool and will be used to explore new concepts and to probe for new insights into old concepts.

VI. EVALUATION

Students will be evaluated by multiple criteria which may include:

- Chapter/Unit Test & Quizzes; these will consist of recall questions, short constructed response questions and open-ended questions requiring students to explain their thinking in arriving at their solution/conclusion.
- Notebooks; specific criteria will be determined by the teacher and will include note taking and homework
- Out-of-class graded assignments such as enrichment projects
- Oral presentations
 - informal- participation in class discussions
 - formal- presentation of special assignments/projects
- Class participation as determined by the teacher
- Open-Ended Questions based upon the High School Proficiency Assessment.

The marking period grades for the course will be determined as follows:

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------|-----|
| • Formal Assessment (Tests/Quizzes) | 50% |
| • Homework, notebook, project, class participation, special graded assignments, and alternative assessments (as determined by teacher) | 50% |

The number of/and frequency of tests/quizzes and other assessments will be determined by the teacher.

The final grade for Analysis/Pre-Calculus will be determined by the following:

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|----------------------------------------|-----|
| • Four quarter grades each worth 22.5% | 90% |
| • One final exam | 10% |

Final exams are departmental tests and will consist of multiple choice and open-ended questions.

VII. REQUIRED RESOURCES

1. The text for this course is:
Larson, Hostetler, and Edwards,. Pre-Calculus with Limits: A graphing Approach-Fourth Edition. Houghton Mifflin Company., Boston, MA: 2005
ISBN: 0-618-39480-X.
2. Other Primary Sources:
Teachers Resources Package, Pre-Calculus with Limits: A Graphing Approach – Third Edition, Houghton Mifflin Company
3. Teacher-Created Resource Binder
4. New Jersey Department of Education. NJ Core Content Curriculum Standards, Trenton, NJ.
5. Texas Instruments TI-83 and TI-84 Graphing Calculator
6. District Laptop Carts
7. End of Course Assessment
Monthly Assessment

VIII. SCOPE AND SEQUENCE

Unit	Textbook Section	Time
1A.	Logic	15 days
1A.1	Argument, Validity, Soundness, Strength, Cognency	
1A.2	Truth Tables, Negations, Conjunctions, Disjunctions, Conditionals, Bi-Conditionals	
1A.3	Evaluating Arguments with Truth Tables	
1A.4	Tautology, Contradiction, Contingency, Logical Equivalence	
Chapter 1	Functions and Their Graphs	20 days
1.2	Functions	
1.3	Graphs of Functions	
1.4	Shifting, Reflecting, and Stretching Graphs	
1.5	Combinations of Functions	
1.6	Inverse Functions	
Chapter 3	Exponential and Logarithmic Functions	20 days
3.1	Exponential Functions and Their Graphs	
3.2	Logarithmic Functions and Their Graphs	
3.3	Properties of Logarithms	
3.4	Solving Exponential and Logarithmic Equations	
3.5	Exponential and Logarithmic Models	
Chapter 4	Trigonometric Functions	25 days
4.1	Radian and Degree Measure	
4.2	Trigonometric Functions: The Unit Circle	
4.3	Right Triangle Trigonometry	
4.4	Trigonometric Function of Any Angle	
4.5	Graphs of Sine and Cosine Functions	
4.6	Graphs of Other Trigonometric Functions	
4.7	Inverse Trigonometric Functions	
4.8	Applications and Models	
Chapter 5	Analytic Trigonometry	30 days
5.1	Using Fundamental Identities	
5.2	Verifying Trigonometric Identities	
5.3	Solving Trigonometric Equations	
5.4	Sum and Difference Formulas	
5.5	Multiple-Angle and Product-Sum Formulas	

Chapter 6	Additional Topics in Trigonometry	5 days
6.1	Law of Sines	
6.2	Law of Cosines	
Chapter 8	Sequences, Series, and Probability	20 days
8.1	Sequences and Series	
8.2	Arithmetic Sequences and Partial Sums	
8.3	Geometric Sequences and Series	
8.4	Mathematical Induction	
8.5	The Binomial Theorem	
8.6	Counting Principles	
8.7	Probability	
Chapter 11	Limits and an Introduction to Calculus	25 days
11.1	Introduction to Limits	
11.2	Techniques for Evaluating Limits	
11.3	The Tangent Line Problem	
11.4	Limits at Infinity and Limits of Sequences	
11.5	The Area Problem	
Final Exam		
Special Schedules and Exams		20 days