

HONORS PRE-CALCULUS COURSE OUTLINE

Revised August 2008

Area: Mathematics
Course: 321.01
Level: Honors
Textbook: PRECALCULUS Enhanced with Graphing Utilities, 5e,
Sullivan, Sullivan, Pearson Prentice Hall, 2009
Length: Full Year
Credit: 5 Credits

I. Prerequisite:

Students enrolling in this course must have attained at least a “B” average in Algebra II Honors or a “C” average with teacher recommendation. Students who have completed Algebra II Academic and wish to enroll in Precalculus Honors must take the Algebra II Honors final exam and score at least 70 %.

II. Course Description:

This is the third year of our Honors mathematics sequence. It is designed to give students the skills they need for the study of calculus. Students will study the theory of functions and graphs, including algebraic and polynomial functions, exponential and logarithmic functions and trigonometric functions. Students will also study applications of trigonometry, trigonometric identities and equations, mathematical induction, and the concept of limits.

III. New Jersey Core Curriculum Content Standards Addressed

4.1, 4.2, 4.3, 4.5

IV. Implementation of Technology

Graphing Calculators will be used throughout the course to encourage discovery, problem solving and to apply mathematics to real life situations. Students are encouraged to purchase their own TI-83+ or TI-84+ graphing calculator for use in this course and for future use in college courses.

Various websites, both interactive and informational, will be infused during class and encouraged to be used by students on their own time.

The Smart Board will be utilized, when appropriate, in presenting or clarifying the current math topic.

V. Materials, Resources, Year Published, and Name of Text

PRECALCULUS Enhanced with Graphing Utilities, 5e, Sullivan, Sullivan, Pearson Prentice Hall, 2009

VI. Description of Instruction:

Students are expected to be active participants in the learning process. The teacher will involve them in the introduction and development of material through questioning and class discussions. This process enables the teacher to assess the students' current knowledge and expand on it. When appropriate, students are guided in discovering the concepts themselves through a study of patterns and by relating the new work to their prior knowledge. The graphing calculator will be used extensively throughout the course both to help students discover concepts and to strengthen their understanding of the concepts. Students are expected to read and study material independently and apply the concepts they learn to new situations. Understanding of concepts is stressed rather than rote memorization of skills. Problem solving is emphasized throughout the course.

Homework will be given almost every day and is an important part of the course, providing students with the opportunity to apply skills learned in class, strengthen their understanding of the concepts and identify areas they don't understand. It is imperative that students do homework regularly and conscientiously. Homework will be reviewed in class and it is the student's responsibility during that time to ask questions about problems he/she doesn't understand, to identify specific mistakes and to take notes on any further explanations concerning these problems. Some of the homework will be based on the sample problems done in class and students are expected to study these examples and use them as a guide when doing their homework. Other problems will require students to extend the concepts learned in class to new situations. Students will also be given reading assignments either to preview material that will be taught the next day or to learn new concepts and procedures independently.

Throughout various chapters in the text students will be provided with websites coordinated with the material designed to help students through interactive tutorials, study tips and practice quizzes.

VII. Student Evaluation:

One to three quizzes, based on the course proficiencies, will be given during a unit and a unit test will be given at the end of each unit. An exam will be given at the end of each semester, covering all the work of that semester.

Homework will be checked regularly. It will usually not be graded for accuracy, but will be considered satisfactory if the work shown indicates the student has made a conscientious effort to complete the assignment. If a student is not able to complete the assignment because he/she doesn't understand the material, he/she may be asked to complete it after reviewing the material in class in order to receive credit for the

assignment. Sometimes homework may be collected and graded as a quiz. This will occur only when the concepts have been thoroughly reviewed. Homework may also be collected and graded after it is reviewed in class. Students are expected to make corrections on homework as it is reviewed. Notebooks may also be collected and graded.

A summer assignment will be given, which reviews concepts from Algebra II. This will count as a major test grade for the first marking period grade.

Grades will be calculated according to the school grading policy and the following guidelines:

A. Marking Period Grade	
1. Quizzes and Tests (may also include class assignments, homework and notebooks)	90 – 95 %
2. Homework	5 – 10 %
B. Final Grade	
1. Each Marking Period	20 %
2. Midterm Exam	10 %
3. Final Exam	10 %

VIII. District Policy: ACADEMIC INTEGRITY

Pupils are expected to be honest in all of their academic work. This means that they will not engage in any of the following acts:

- Cheating on examinations or other school assignments, including but not limited to, the non-authorized use of books or notes, the use of crib sheets, copying from other students' papers, exchanging information with other students orally, in writing, or by signals, obtaining copies of the examination illegally and other similar activities. Cheating through the use of technology to exchange information on any school assignment, examination, etc. is prohibited. Technology is defined as, but not limited to, computers, telephones, text messaging, palm pilots, calculators, cameras or any other hand held device.
- Plagiarism is not permitted in term papers, themes, essays, reports, images, take-home examinations, and other academic work. Plagiarism is defined as stealing or use without acknowledgment of the ideas, words, formulas, textual materials, on-line services, computer programs, etc. of another person, or in any way presenting the work of another person as one's own.

- Falsifications, including forging signatures, altering answers after they have been graded, inserting answers after the fact, erasing of grader's markings, and other acts that allow for falsely taking credit.

A pupil found guilty of academic dishonesty may be subjected to a full range of penalties including, but not limited to reprimand and loss of credit for all of the work that is plagiarized. Disciplinary action may also be a consequence of such behavior. Additional consequences may apply as defined in specific department policies and guidelines.

A teacher who believes that a pupil has been academically dishonest in his/her class should resolve the matter in the following manner:

- Reprimand the student orally and/or in writing. The teacher is also authorized to withhold credit in the work due to academic dishonesty.
- If warranted, the teacher shall file a written complaint against the student with the Administration, requesting a more stringent form of discipline. The complaint must describe in detail the academic dishonesty that is alleged to have taken place, and must request that the matter be reviewed by the Administration.
- The Administration will determine if further discipline of the pupil is appropriate, and will determine the nature of the discipline on a case-by-case basis.
- If the pupil is not in agreement with the disciplinary action of the Administration, he/she may appeal the action first to the Principal and secondly to the Superintendent. If the pupil is dissatisfied with the Superintendent's disposition of the case, he/she may grieve the action in accordance with Policy No. 5710, Pupil Grievance.

IX. District Policy: Discrimination

High Point Regional High School's curriculum and instruction are aligned to the State's Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

Proficiencies:

Summer Assignment

Review in class: 7 days

Students will be able to:

1. work with sets and find union, intersection and complement of a set.
2. classify real numbers and apply the properties of real numbers.
3. apply basic algebra concepts, evaluate expressions, determine domain, and correctly laws of exponents.

4. factor polynomials and know formulas for special products.
5. divide polynomials using long division and synthetic division.
6. work with rational expressions. (Reduce, add, subtract, multiply and divide rational expressions).
7. solve and graph linear equations and inequalities, absolute value and, rational equations.
8. solve quadratic equations by factoring, square roots, completing the square and the Quadratic Formula.
9. add, subtract, multiply, and divide complex numbers and, Solve quadratic equations in the complex number system
10. use interval notation.
11. solve absolute value inequalities.
12. work with nth roots.
13. simplify radicals and rationalize denominators.
14. use the distance and midpoint formulas.
15. graph equations by hand and using the graphing calculator.
16. use the graphing utility to create tables, approximate the intercepts from a graph.

Resources:

1. Textbook: Appendix A and Chapter 1.1
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.

Unit 1 Graphs

Time: 6 days

Students will be able to:

1. find intercepts algebraically from an equation.
2. test an equation for symmetry.
3. recognize and graph the following key equations:
 $f(x) = x$, $f(x) = x^2$, $f(x) = x^3$, $f(x) = 1/x$, $f(x) = \sqrt{x}$, $f(x) = e^x$, $f(x) = |x|$.
4. solve equations using a graphing utility.
5. use the slope formula, the general equation of a line, the point slope and slope intercept equation of a line, and find the equations of parallel and perpendicular lines.
6. calculate and interpret the slope of a line.
7. recognize the equation of a circle and identify the radius and center and, given the radius and center of circle, write the equation of the circle.

Resources and Activities:

1. Textbook: Chapter 1.2 – 1.5
2. Applications and Extensions (Modeling) (from textbook):
 - a. p. 42 - 43 ex. 115, 119, 120, 124
3. Graphing Calculator Activities (from textbook):
Chapter Project p. 54
4. Teacher prepared worksheets and transparencies.
5. Graphing calculator.
6. Smart Board.

Unit 2 Functions and Graphs

Time: 20 days

Students will be able to:

1. determine whether a relation represents a function and find the value of a function.
2. represent functions numerically, algebraically and graphically.
3. determine the sum, difference, product and quotient of functions.
4. determine the domain and range of functions.
5. Identify the graph of a function and obtain information from the graph of a function.
6. determine continuity, increasing-decreasing behavior, local minima and maxima, symmetry, asymptotes and end behavior of a function both graphically and algebraically.
7. find the average rate of change of a function.
8. recognize the characteristics of the following functions: $f(x) = x$, $f(x) = x^2$, $f(x) = x^3$, $f(x) = 1/x$, $f(x) = \sqrt{x}$, $f(x) = \sqrt[3]{x}$, and $f(x) = |x|$
9. graph piecewise functions.
10. graph functions using vertical and horizontal shifts, compressions and stretches, and reflections about the x and y axis.
11. build and analyze functions.
12. recognize and graph linear and quadratic functions.

Resources and Activities:

1. Textbook: Chapter 2
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.

Unit 3 Linear and Quadratic Functions

Time: 8 days

Students will be able to:

1. recognize and graph linear and quadratic functions.
2. draw and interpret Scatter Diagrams and find the Line of Best Fit.
3. graph quadratic functions using transformations, symmetry and intercepts.
4. build quadratic models from verbal descriptions and data.

Resources and Activities:

1. Textbook: Chapter 3
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.

Unit 4 Polynomial, Power and Rational Functions

Time: 14 days

Students will be able to:

1. identify and graph polynomial functions, predict their end behavior and find their real zeros algebraically and graphically.
2. identify and graph power functions of the form $f(s) = ax^n$.
3. find the domain and asymptotes of rational functions, and analyze and construct graphs of rational functions.
4. apply the Remainder Theorem, Factor Theorem, theorems for bounds on zeros, and the Intermediate Value Theorem.
5. solve polynomial equations.
6. determine the complex zeros of polynomial equations, and determine the polynomial with the specified zeros.
7. apply polynomial, power and rational function to real world problems.

Resources and Activities:

1. Textbook: Chapter 4
2. Chapter Project (from Textbook)
 - p. 244 Determine the type of polynomial that best fits the data given.
3. Teacher prepared worksheets and transparencies.
4. Graphing calculator.
5. Smart Board.

Unit 5 Exponential, Logistic and Logarithmic Functions Time: 20 days

Students will be able to:

1. form composite functions and find their domain.
2. determine if a function is one-to-one, and find the inverse of a function
3. evaluate exponential expressions.
4. identify and graph exponential and logistic functions.
5. use exponential growth, decay and regression to model real life problems.
6. convert equations between logarithmic form and exponential form.
7. evaluate common and natural logarithms.
8. graph common and natural logarithmic functions.
9. apply the properties of logarithms to evaluate expressions.
10. solve exponential and logarithmic equations algebraically and graphically.
11. use exponential and logarithmic equations to solve real life problems.

Resources and Activities:

1. Textbook: Chapter 5
2. Graphing Calculator Activities (attached)
 - “How Much Do You Really Pay” (exponential functions)
 - “Follow the Bouncing Ball” (exponential functions)

3. Teacher prepared worksheets and transparencies.
4. Graphing calculator.
5. Smart Board.

Unit 6 Trigonometric Functions

Time: 22 days

Students will be able to:

1. convert between radians and degrees.
2. find arc length, angular and linear speed, and area of a sector of a circle.
3. define and evaluate the six trigonometric functions in terms of the lengths of the sides of a right triangle, the rotation of a ray in standard position, and a point on a unit circle.
4. find exact values of trigonometric functions and use the calculator to approximate values.
5. determine the range, domain, and period of trigonometric functions.
6. graph the six trigonometric functions, and transformations of these graphs.
7. apply the concepts of trigonometry to solve real world problems.

Resources and Activities:

1. Textbook: Chapter 6
2. Graphing Calculator Activities (attached)
 - “Swing Batter” (Linear and Angular Velocity)
 - “Don’t Forget the Sunscreen” (trigonometric graphing)
 - “How Do You Know How Low You Can Go” (trigonometric graphing)
 - Parking Space Problem (attached)
3. Teacher prepared worksheets and transparencies.
4. Graphing calculator.
5. Smart Board.

Unit 7 Analytic Trigonometry

Time: 20 days

Students will be able to:

1. find an exact value of an inverse sine, cosine or tangent function.
2. find an approximate value of an inverse sine, cosine or tangent function.
3. find the exact value of composite functions.
4. find the inverse function of a trigonometric function and solve equations involving inverse functions.
5. know the definitions of the inverse secant, cosecant and cotangent functions and use the calculator to evaluate $\sec^{-1}x$, $\csc^{-1}x$, $\cot^{-1}x$.
6. use algebra to simplify trigonometric expressions.
7. use Reciprocal Trigonometric Identities, Quotient Identities, Pythagorean Identities, Co-Function Identities and Odd-Even Identities to simplify trigonometric expressions and solve trigonometric equations.
8. establish identities.
9. apply the identities for the cosine, sine and tangent of a difference or sum.
10. apply the Sum and Difference Formulas, Double-angle Formulas, and Half-angle Formulas.
11. use trigonometric concepts to solve equations and real world problems.

Resources and Activities:

1. Textbook: Chapter 7 (omit 7.6)
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.

Unit 8 Applications of Trigonometric Functions**10 days**

Students will be able to:

1. find the value of trigonometric functions of acute angles using right triangles.
2. solve right triangles.
3. solve applied problems.
4. apply the Law of Sines and Law of Cosines to solve triangles.
5. find the area of any triangle.
6. analyze and solve simple harmonic motion problems.

Resources and Activities:

1. Textbook: Chapter 8
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.

Unit 9 Polar Coordinates and Vectors**Time: 10 days**

Students will be able to:

1. convert points and equations from polar to rectangular form and vice versa.
2. transform equations from polar to rectangular form.
3. graph polar equations and determine the maximum r-value and the symmetry of the equation's graph.
4. represent complex numbers in trigonometric form and perform operations on them.
5. use De Moivre's Theorem
6. perform operations with vectors and use vectors to solve real world problems.
7. find dot products and projections of vectors and apply to real world problems.

Resources:

1. Textbook: Chapter 9.1 – 9.5
2. Graphing Calculator Activities (teacher prepared materials)
“Exploring Polar Graphs”
3. Graphing calculator.
4. Smart Board.

Unit 10 An Introduction to Calculus**Time: 10 days**

Students will be able to:

1. calculate instantaneous velocities and derivatives using limits.
2. calculate definite integrals using areas.
3. use the properties of limits to evaluate one sided limits, two sided limits and limits involving infinity.
4. estimate derivatives and integrals using numerical techniques.

Resources and Activities:

1. Textbook, Chapter 14
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
3. Smart Board.