

## **HONORS PRECALCULUS**

**Course Number:** 350-H

**Grade:** 11, 12

**Credits:** 5

**Recommended Prerequisite:** A grade of “B” or better in Honors Algebra 2.

### **Required Materials:**

1. Writing utensil
2. Textbook or online textbook access
3. Notebook
4. Scientific or graphing calculator

### **Course Description:**

This course is designed for the student who intends to take Calculus or AP Calculus in the future. Advanced topics in Algebra will be covered, with an emphasis on trigonometric functions and their inverses, exponential and logarithmic functions, matrices and determinants, quadratic relations and vectors. Graphing calculators will be used to fully explore advanced computations and applications.

### **General Performance Objectives:**

1. The student will be able to:
2. Graph functions using various tools and methods.
3. Determine the minimum and/or maximum of the graph of a function..
4. Model periodic phenomena with trigonometric functions.
5. Prove and apply trigonometric identities.
6. Use matrices and matrix techniques to represent and solve problems involving systems and vectors.
7. Work with polynomial functions and their graphs.
8. Use logarithms and exponential functions to model real life situations such as exponential growth and decay.
9. Understand and evaluate basic limits.

### **Massachusetts Curriculum Frameworks for Mathematics:**

<http://goo.gl/tv2ya>

### **Units and Themes:**

	Unit Titles	Standards
I.	Conic Sections	G-GPE
II.	Functions	F-BF
III.	Polynomial Functions	N-CN; A-APR; F-IF
IV.	Logarithmic and Exponential Functions	F-BF; F-LE
V.	Trigonometric Functions	F-TF
VI.	Trigonometric Identities and Equations	F-TF

<b>VII.</b>	<b>Vectors</b>	<b>N-VM</b>
<b>VIII.</b>	<b>Matrices and Determinants</b>	<b>N-VM; A-REI</b>

**Course Outline:** (number of days are an approximation and may be adjusted by course demands)

- I. **Conic Sections** (20 Days)
  - A. The Circle
  - B. The Ellipse
  - C. The Hyperbola
  - D. The Parabola
  - E. Translations of conic sections
- II. **Functions** (15 Days)
  - A. Introduction to linear and quadratic modeling
  - B. Relations and functions with domain and range
  - C. Composition of functions
  - D. Inverse functions
  - E. Piecewise functions
  - F. Symmetry and reflections
  - G. Graphing “eight basics” with transformations
  - H. Distance from a point to a line
- III. **Polynomial and Rational Functions** (15 Days)
  - A. Remainder and Factor Theorems
  - B. Characteristics of graphs of polynomial functions
  - C. Find complex zeros of polynomial functions
  - D. Characteristics of graphs of rational functions
  - E. Slant asymptotes
  - F. Introduction to limit notation
- IV. **Logarithmic and Exponential Functions** (12 Days)
  - A. Characteristics of graphs of exponential functions
  - B. Characteristics of graphs of logarithmic functions
  - C. Solving exponential and logarithmic equations and inequalities
  - D. Exponential growth and decay models
- V. **Trigonometric Functions** (20 Days)
  - A. Review of angles in the coordinate plane
  - B. Applications of angular and linear velocity
  - C. Review of definitions of the trigonometric functions
  - D. Review of trigonometric function values of special, quadrantal and any angle
  - E. Review of fundamental trigonometric identities
  - F. Review of graphing sine, cosine and tangent functions
  - G. Graphing the reciprocal trigonometric functions
  - H. Inverse trigonometric functions
- VI. **Trigonometric Identities and Equations** (15 Days)
  - A. Sum and difference identities
  - B. Double angle identities
  - C. Other trigonometric identities
  - D. Proving trigonometric identities
  - E. Solving trigonometric equations
- VII. **Vectors** (10 Days)
  - A. Magnitude and direction of vectors

- B. Position vectors in rectangular coordinates
- C. Scalar multiples, vector sums and resultant vectors
- D. Operations with vectors
- E. Unit vectors
- F. Magnitude and direction of resultant vectors
- G. Applications

**VIII. Matrices and Determinants (12 Days)**

- A. Organizing data into a matrix
- B. Adding and subtracting matrices
- C. Multiplying matrices
- D. Geometric transformations using matrices
- E. Determinants and matrix inverses
- F. Solving matrix equations
- G. Solving systems of linear equations using inverse matrices and Cramer's Rule
- H. Augmented matrices and systems

**IX. Review, Midterm Exam, and Final Exam (5 Days)**

**Suggested Instructional Strategies:**

1. Lecture
2. Written exercises
3. Group work
4. Projects
5. Use of manipulatives and online tools
6. Use of a variety of questioning techniques
7. Board work
8. Calculator/graphing calculator activities
9. Games (Math Jeopardy, etc.)
10. Student presentations
11. A variety of assessment tools (partner quizzes, etc.)

**Use of Tools/Technology:**

1. Use of Geometer's Sketchpad software to model and investigate concepts.
2. Use of Desmos, Geogebra and other online dynamic graphing sites.
3. Use of TI-84 graphing calculators and TI SmartView presentation software.
4. Online video selections, including Kahn Academy and YouTube.
5. Use of Google apps for education.
6. Use of iPads and students' own devices.

**ASSESSMENT TECHNIQUES**

1. Students will take free-response performance tests.
2. Students will be formatively assessed using Google forms, Quizlet, Kahoot or similar.
3. Students will respond to essential questions.
4. Students will be evaluated on District Determined Measures.
5. Students will participate in classroom discussions.
6. Students will demonstrate problem-solving skills.
7. Students will work cooperatively and report or present results.
8. Students will create projects and do presentations to demonstrate mastery.