Equinox Program

Course Title: Pre-Calculus Honors

Course Description

Pre-Calculus Honors is an instructor-led course designed to follow and build upon advanced algebra. Topics include linear, quadratic, polynomial, exponential, logarithmic, and trigonometric functions. Students apply vectors, sequences, series, and matrices to solve problems. Advanced topics in functions and graphs, trigonometry and discrete mathematics are also covered. This course prepares students for success in AP Calculus AB and/or BC.

Essential Questions

- What relations exist between the analytic expression of a function and a graph or a table of values for this function?
- What is trigonometry and how can it be used to study mathematical constructs such as coordinate space and complex numbers?
- How does mathematics address problems such as counting, probabilities, and series?

Outcomes

Upon successful completion of this course, students will:

- Know basic characteristics and graphs for the following functions: polynomials, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
- Understand basic topics in discrete mathematics, including solving matrices applied to systems, limits of sequences and series, permutations and combinations, and proof by induction.
- Apply trigonometric functions to mathematical constructs and coordinate systems resulting in vectors, parametric equations, and the polar coordinate system.
- Use technology for graphing and evaluation functions:
    - Generate the complete graph for the elementary functions.
    - Locate the x-intercepts, the relative extrema and determine asymptotic behaviors.

Instructional Strategies

To meet the objectives of this course, instructional strategies will include interactive lectures, technology explorations, real life applications, chapters' projects, summary and review using wordle.net and semantic maps, side-by-side Algebraic and Graphing solutions, handouts, and group activities such as skill building activities, and concepts and vocabulary activities.

Resources and Materials

- **Course Text**
  Sullivan, Michael. Precalculus: Enhanced with Graphing Utilities. 5th edition, Pearson. ISBN: 9780136015789.

- **Web sites**
  www.khanacademy.org
- **Materials**

Each student is required to have a graphing calculator. TI-83/84 is preferred: however, as long as a student is familiar with the functionality associated with his/her calculator, it will suffice.

Student Assessment

- **Pre-Assessment**
  A comprehensive pre-test will be given on the first day of the session.

- **CTD Grading Scale**

A+	100-97%	A	96-93%	A-	92-90%
B+	89-87%	B	86-83%	B-	82-80%
C+	79-77%	C	76-73%	C-	72-70%
D+	69-67%	D	66-63%	D-	62-60%
F	below 60%				

- **Breakdown of Final Grade**
  30% Homework, 40% Tests, 15% Midterm, 15% Final Exam

- **Post-Assessment**
  A comprehensive post-test (same as pre-test) will be given at the end of the session.

Schedule

Note: students are expected to actively take notes everyday during class lecture and practice.

Dates	Topics	In-class Activities	Assignments and Assessments
Monday	Chapter 2: Properties of Functions and their Graphs	Practice problems on: • Domain and Range • Symmetry • Continuity • Intervals of Increase and Decrease • Extrema • Boundedness • End-Behavior Limits • Graphical Transformations • Twelve Basic Functions • Building Functions from Functions • Function Composition • Inverse Functions and Relations	Pre-Test: Pre-Calculus core concepts. Handouts and group activity Homework: 2.1: 45, 53, 59, 63, 93 2.2: 17, 23 2.3: 45, 55 2.4: 27, 31 2.5: 57, 63 2.6: 15, 25
Tuesday	Chapter 3: Polynomials (part 1)	Practice Problems on: • Linear and Quadratic Polynomials • Complex Numbers • Factoring Polynomials • End-Behavior of P(x) • Fundamental Theorem of Algebra	Test 1: Properties of Functions Homework: 3.1: 13, 21, 25, 45 3.2: 13 3.3: 33, 39, 47, 53 3.4: 3, 19, 31 3.5: 11, 15, 35
Wednesday	Chapter 3: Polynomials (part 2)	Practice problems on: • Rational Functions (and graphing) • Solving Rational Equations in one Variables • Solving General Inequalities in One Variable	Handouts and group activity Homework: see Tuesday problems

Dates	Topics	In-class Activities	Assignments and Assessments
Thursday	Chapter 4: Exponential and Logarithmic Functions	Practice Problems on: • Describing and Graphing Exponential Functions • Describing and Graphing Logarithmic Functions • Properties of Logarithmic Functions • Solving Exponential and Logarithmic Equations • Compounding Interest	Test 2: Polynomials Handouts and group activity 4.1: 33, 35, 69 4.2: 17, 21, 43 4.3: 25, 29 4.4: 35, 37 4.5: 73, 75 4.6: 17, 21, 25, 33
Friday	Chapter 5: Trigonometric Functions (part 1)	Practice Problems on: • Angles and their Measure (Degrees, Radians) • Trigonometric Functions of Acute Angles (Right Triangle Trigonometry) • Extended Trigonometry and the Unit Circle • Graphs of Sinusoids	Test 3: Exponential and Logarithmic Functions Homework: 5.1: 19, 35 5.2: 13, 63, 69, 73 5.3: 17, 45, 63 5.4: 51, 55, 77 5.5 45 5.6: 5, 15, 27, 39, 47 5.7: 53 5.8: 21, 27 5.9: 5
Monday	Chapter 5: Trigonometric Functions (part 2)	Practice problems on: • Graphs of Tangent, Cotangent, Secant, Cosecant • Inverse Trigonometric Functions and Their Graphs • Solving Trigonometric Application Problems	Handouts and group activity Homework: See Friday
Tuesday	Midterm Exam	• Review for Midterm Exam (Morning)	Midterm Exam (Afternoon)
Wednesday	Chapter 6: Analytic Trigonometry	Practice problems on: • Fundamental Identities (Symmetry, Reciprocal, Pythagorean) • Proving Identities • Sum and Difference Identities • Multiple-Angle Identities	Handouts and group activity Homework: 6.1: 37, 41, 51, 55 6.2: 29, 39, 63, 67, 75, 81 6.3: 43, 49, 59, 85 6.4: 25, 47, 57 6.5: 29, 37 6.6: 17
Thursday	Chapter 7: Applications of Trigonometric Functions	Practice Problems on: • Law of Sines and the Ambiguous Case • Law of Cosines • Applications of Trigonometry	Test 4: Identities Handouts and group activity Homework: 7.1: 23, 27, 49 7.2: 29, 31, 45, 49, 51 7.3: 29, 43 7.4: 11, 17, 29, 73, 77 7.5: 9, 71, 79 7.7: 11, 25, 27 7.8: 5, 25, 45

Dates	Topics	In-class Activities	Assignments and Assessments
Friday	Chapter 8: Polar Coordinates; Vectors	Practice Problems on: • Vectors • Polar Coordinates	Chapter project Polar Mode on the Calculator Homework: 8.1: 9, 11, 27 8.2: 9, 19, 43 8.3: 17, 19, 31 8.4: 15, 21, 37 8.5: 5, 7, 13, 15
Monday	Chapter 10: Systems and Matrices	• Matrices on the Calculator Practice Problems on: • Solving Systems of Equations • Basic Partial Fractions • Systems of Inequalities in Two Variables • Matrix Algebra	Test 5: Polar Coordinates; Vectors Handouts and group activity Homework: 10.2: 31, 43, 65 10.3: 21, 49 10.4: 29, 41, 67, 69, 75 10.5: 13, 41, 49 10.6: 11, 29 10.7: 11, 19, 25
Tuesday	Chapter 11: Sequences; Induction	Practice problems on: • Sequences and Series • Proof by Induction	Test 6: Systems and Matrices Handouts and group activity Homework: 11.1: 23, 25, 29, 51, 59 11.2: 11, 31, 39, 51, 57 11.3: 7, 13, 25, 41 11.4: 15, 17, 31, 35 11.5: 25, 41 11.6: 19, 31 11.7: 25, 37 11.8: 15
Wednesday	Chapter 12: Counting & Probability	Practice problems on: • Probability • Permutations • Combinations	Forming Codes Activity Homework: 12.1: 23, 39, 67, 75, 87 12.3: 67, 69, 75, 63 12.4: 9, 15 12.5: 21, 23
Thursday	Final Exam	Review for Final Exam (Morning)	Final Exam (Afternoon)
Friday	Morning: Chapter 9: Analytic Geometry Afternoon: Closing Interviews	Note-taking Practice problems on: • Circles • Parabolas • Ellipses • Hyperbolas • Conics in Polar	Analyzing Pluto's unusual Orbit

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.