Pre-Calculus Course Syllabus

Description:

Students, as mathematic analysts, investigate how advanced mathematics concepts are used to solve problems encountered in operating national parks. As students venture from algebra to trigonometry, they analyze and articulate the real-world application of these concepts. The purpose of this course is to study functions and develop skills necessary for the study of calculus. This course includes algebra, analytical geometry, and trigonometry.

Pre-Calculus is an honors-only course.

Prerequisites: Algebra 1, Algebra 2, Geometry

Estimated Completion Time: 2 segments/32-36 weeks

Major Topics and Concepts:
Starting Segment I or Segment II:

Segment I

- Functions
- Domain and range
- Rigid and non-rigid transformations
- Composition and arithmetic of functions
- Function inverses
- Solve and graph quadratic functions
- Characteristics of a polynomial function
- Rational Root Theorem, long and synthetic division, Fundamental Theorem of Algebra, and Descartes' Rule
- Using the Intermediate Value Theorem and the Extreme Value Theorem
- Complex numbers as solutions to polynomial equations
- Domain and asymptotes of a rational function
- Analyze and graph a rational function with and without a calculator
- Analyze and graph the exponential function
- Analyze and graph the logarithmic function
- Properties of logarithms
- Exponential and logarithmic equations
- Angles in radians and degrees
- Define the trigonometric functions using the coordinates of a unit circle and using a right triangle
- Evaluate the trigonometric function values of any angle measure
- Analyze and graph sine, cosine, and tangent functions with and without a calculator
- Inverse trigonometric values
- Applications of right-triangle trigonometry

- Evaluate trigonometric values using identities
- Prove that a given equation is an identity
- Solve equations that contain trigonometric functions
- Applications involving solving trigonometric equations
- Use argument identities

Segment II

- Use the Law of Sines and Law of Cosines to solve a triangle, including the ambiguous case
- Applications of the Law of Sines and Cosines, including navigation
- Find the area of the triangle including Heron's formula
- Vectors in the Plane: vector arithmetic, dot product, angle between two vectors
- Vectors in Space: vector arithmetic, dot product, cross product, and angle between two vectors
- Arithmetic of complex numbers using Vectors and DeMoivre's Theorem
- Terms of a sequence, sigma notation
- Arithmetic sequences and series
- Geometric sequences and series
- Proof by Mathematical Induction, including divisibility proofs
- Analyze and graph equations that produce parabolas, ellipses, and hyperbolas
- Parametric equations and graphs and conversion to rectangular form
- Parametric motion
- Domain and range of parametric equations
- Plotting points in the polar system
- Convert rectangular coordinates to polar coordinates
- Convert polar coordinates to rectangular coordinates
- Convert rectangular equations to polar equations
- Convert polar equations to rectangular equations
- Graphing polar equations
- Evaluating limits numerically
- Evaluating limits graphically
- Evaluating limits analytically
- Evaluating one-sided limits
- Continuity at a point, Types of discontinuities

Course Assessment and Participation Requirements:

To achieve success, students are expected to submit work in each course weekly. Students can learn at their own pace; however, "any pace" still means that students must make progress in the course every week. To measure learning, students complete self-checks, practice lessons, multiple-choice questions, projects, discussion-based assessments, and discussions. Students are expected to maintain regular contact with teachers; the minimum requirement is monthly. When teachers, students, and parents work together, students are successful.