Online Courses for High School Students
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Pre-Calculus

Semester A

In this course, students will understand and apply concepts, graphs and applications of a variety of families of functions, including polynomial, exponential, logarithmic, logistic and trigonometric. An emphasis will be placed on use of appropriate functions to model real world situations and solve problems that arise from those situations. A focus is also on graphing functions by hand and understanding and identifying the parts of a graph.

Prerequisite: Algebra 2
Course Length: Two Semesters
Materials: A scientific and/or graphics calculator is recommended for work on assignments.

Module 1: Equations and Inequalities

- Lesson 1: Linear Equations
- Lesson 2: Fractional Coefficients
- Lesson 3: Special Cases
- Lesson 4: Quadratics by Factoring and Square Roots
- Lesson 5: Quadratics by Completing the Square and Quadratic Formula
- Lesson 6: Compound Inequalities
- Lesson 7: Inequalities with Absolute Value

Module 2: Functions

- Lesson 1: Introduction to Functions
- Lesson 2: Linear Functions and Their Graphs
- Lesson 3: Finding the Equation of a Line
- Lesson 4: Parallel and Perpendicular Lines
- Lesson 5: Graphs of Functions
- Lesson 6: Transformation of Functions
- Lesson 7: Composite Functions
- Lesson 8: Inverse Functions

Module 3: Polynomial and Rational Functions

- Lesson 1: Quadratic Functions
- Lesson 2: Rational Functions
- Lesson 3: Polynomial Function
- Lesson 4: Remainder and Factor Theorems
- Lesson 5: Rational Zero Theorem
- Lesson 6: Fundamental Theorem of Algebra
- Lesson 7: Direct and Inverse Variation

Module 4: Exponential and Logarithmic Functions

- Lesson 1: Exponential Functions
- Lesson 2: Logarithmic Functions
- Lesson 3: Logarithmic Properties and Graphs
- Lesson 4: Solving Logarithmic and Exponential Equations
- Lesson 5: Real-World Application: Compound Interest
- Lesson 6: Real-World Application: Half-Life and Logistic Growth

Module 5: Right Triangle Trigonometry

- Lesson 1: Angles, Degrees and Triangles
- Lesson 2: Similar Triangles
- Lesson 3: Definitions of Trig Functions
- Lesson 4: Evaluating Trig Functions
- Lesson 5: Solving Right Triangles
- Lesson 6: Solving Angles of a Right Triangle

Module 6: Trig Functions and the Unit Circle

- Lesson 1: Angles in the Cartesian Plane
- Lesson 2: The Unit Circle
- Lesson 3: Basic Trig Identities
- Lesson 4: Radian Measure
- Lesson 5: Arc Length and the Area of a Circular Sector
- Lesson 6: Linear and Angular Speed

Semester B

Pre-Calculus part B covers the major units of introductory trigonometry and graphs, trigonometric equations and identities, analytical trigonometry, sequences and series, conic sections, and an introduction to calculus. A focus is also on graphing functions by hand and understanding and identifying the parts of a graph.

Module 7: Graphs and Trig Equations

- Lesson 1: Periodic Graphs
- Lesson 2: Graphs of the Sine and Cosine Functions
- Lesson 3: Transformations of the Sine and Cosine Graphs
- Lesson 4: Graphs of Tangent, Cotangent, Secant and Cosecant
- Lesson 5: Sinusoidal Regression
- Lesson 6: Inverse Trig Functions and Their Graphs
- Lesson 7: Solving Trig Equations

Module 8: Trig Identities

- Lesson 1: Simplifying Trig Expressions
- Lesson 2: Sum and Difference Identities
- Lesson 3: Double Angle and Half Angle Identities
- Lesson 4: Law of Sines
- Lesson 5: Law of Cosines
- Lesson 6: Area of a Triangle

Module 9: Sequences and Series

- Lesson 1: Sequences
- Lesson 2: Series and Sigma Notation
- Lesson 3: Arithmetic Sequences
- Lesson 4: Arithmetic Series
- Lesson 5: Geometric Sequence
- Lesson 6: Geometric Series

Module 10: Conic Sections

- Lesson 1: Distance and Midpoint Formulas
- Lesson 2: Circles
- Lesson 3: Hyperbolas
- Lesson 4: Parabolas
- Lesson 5: Ellipses
- Lesson 6: Solving Quadratic Systems of Equations
- Lesson 7: Identifying the General Form of a Conic Section

Module 11: Introduction to Calculus

- Lesson 1: Limits with Tables and Graphs
- Lesson 2: Limits with Algebra
- Lesson 3: One Sided Limits
- Lesson 4: Continuity

Module 12: Challenge