Online Courses for High School Students
1-888-972-6237

Calculus

This High School Calculus course is designed with the intent for students to incorporate the concepts of all previous math courses and expand upon these concepts with the implementation of limits. Emphasis is placed upon the multi-representational approach to calculus where problems and their solutions are explored and interpreted graphically, numerically, analytically, and verbally. Students will also be required to explain their answers in written form and to use graphing calculators. These calculators will be used in a variety of ways including multi-representation of equations (graphs and tables) and for conducting explorations with various functions and how different values change the look of the function.

Prerequisite: Pre-Calculus
Course Length: Two Semesters
Required Text: Digital Textbook: Calculus, Volume 1 from OpenStax
Materials: A graphing calculator. Gcalc is a free download if you do not have a hand-held.

Semester A

Module 1

- Functions and Change
- Exponential Functions
- New Functions from Old
- Logarithmic Functions
- Trigonometric Functions
- Powers, Polynomials, and Rational Functions
- Introduction to Continuity
- Limits

Module 2

- How Do We Measure Speed?
- The Derivative at a Point
- The Derivative Function
- The Second Derivative
- Differentiability

Module 3

- Powers and Polynomials
- The Exponential Function
- Product and Quotient Rules
- The Chain Rule

- The Trigonometric Functions
- The Chain Rule and Inverse Functions
- Implicit Functions
- Hyperbolic Functions
- Linear Approximation and the Derivative
- Theorems About Differentiable Functions

Module 4

- Using First and Second Derivatives
- Optimization
- Families of Functions
- Optimization Geometry and Modeling
- Applications to Marginality
- Rates and Related Rates
- L'Hopital's Rule, Growth and Dominance
- Parametric Equations

Semester B

Module 5

- Measuring Distance
- The Definite Integral
- The Fundamental Theorems and Interpretations
- Theorems About Definite Integrals
- Antiderivatives Graphically and Numerically
- Constructing Antiderivatives Analytically
- Differential Equations
- Second Fundamental Theorem of Calculus
- The Equations of Motion

Module 6

- Integration by Substitution
- Integration by Parts
- Table of Integrals
- Algebraic Identities and Trigonometric Substitutions
- Approximating Definite Integrals
- Improper Integrals

Module 7

- Areas and Volumes
- Applications to Geometry
- What is a Differential Equation
- Slope Fields
- Separation of Variables