Calculus - Advanced Placement (AP)

Mathematics

Grade(s) 11th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

This course is designed for students who expect to study engineering, economics, mathematics or physical sciences in college. The students will be taught in preperation for the AP Calculus AB exam and will have the opportunity to take that test at their expense.

Scope And Sequence

Timeframe	Unit	Instructional Topics
4 Week(s)	Functions and Limits	1. Review of Functions 2. Continuity 3. Limits 4. Existance Theorems
9 Week(s)	The Derivative and its Applications	1. Average Rate of Change 2. Definition of the Derivative 3. Behavior of a function and its derivative 4. Relative Extrema 5. Absolute Extrema 6. Differentiation Rules 7. Implicit Differentiation 8. The second derivative 9. Mean Value Theorem and Tangent Line Approximations
9 Week(s)	The Integral - definitions and applications	1. Basic Integration Rules 2. Velocity Graphs 3. Riemann Sums 4. The Area Function
5 Week(s)	Applications of Integration	1. Volumes of solids with cross sections 2. Solids of Revolution 3. Differential Equations 4. Slope Fields
4 Week(s)	Review for AP Exam	

Materials and Resources

Rogawski: Calculus, Early Transcendentals
PLHSAPCalculus - blackboard

Prerequisites

Successful completion of Trigonometry and Analysis and teacher approval.

Course Details

Unit: Functions and Limits   **Duration:** 4 Week(s)

Unit Overview

The unit will cover the algebraic, graphical and numerical representations of limits.

Academic Vocabulary

Domain
Range
Continuity
Limits
Intermediate Value Theorem
Extreme Value Theorem
Infinite Limits
Asymptotes
Piecewise functions

Topic: Review of Functions   **Duration:** 3 Day(s)

Topic Overview

Function Notation
Domain and Range
Odd and Even Functions
Transformations of functions: analytically, verbally, numerically and graphically
Composition of functions
Piecewise functions

Topic: Continuity   **Duration:** 2 Day(s)

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Topic Overview
Verifying Continuity
Graphical properties of continuity

Topic: Limits	**Duration:** 6 Day(s)

Topic Overview
Limits of Algebraic and Trigonometric Functions: numerically and graphically
Infinite Limits: Asymptotic behavior
Limits at Infinity: Horizontal Asymptotes
One Sided Limits

Topic: Existance Theorems	**Duration:** 1 Day(s)

Topic Overview
Intermediate Value Theorem
Extreme Value Theorem

Unit: The Derivative and its Applications	**Duration:** 9 Week(s)

Unit Overview
This unit will define the derivative. Investigate functions and their derivatives algebraically and graphically.

Academic Vocabulary
Difference Quotients
Average Velocity
Instantaneous Rate of Change
Critical Numbers
Relative Extrema
Absolute Extrema
Related Rates
Acceleration
Parametric Equations
Chain Rule
Tangent Lines
Secant Lines
Mean Value Theorem

Topic: Average Rate of Change	**Duration:** 2 Day(s)

Topic Overview
Difference Quotients from Data, Graphical Displays
Average Velocity as change in position/time

Topic: Definition of the Derivative	**Duration:** 4 Day(s)

Topic Overview
Defintion of Derivative (limiting value of average rate of change)
Secant lines vs tangent lines
Instantaneous Rate of Change

Topic: Behavior of a function and its derivative	**Duration:** 2 Day(s)

Topic Overview
Investigate function both alegebraically and graphically that confirm the behavior of a function and its derivaitve.

Topic: Relative Extrema	**Duration:** 2 Day(s)

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Topic Overview
Locating critical numbers
Using the derivative to determine extrema
Sketching the dertivative based upon the function

Topic: Absolute Extrema	**Duration:** 4 Day(s)

Topic Overview
Closed intervals
Applied Max/Min Problems

Topic: Differentiation Rules	**Duration:** 5 Day(s)

Topic Overview
Power, Constant Multiple, Sum, Product and Quotient Rules
Transcendental Rules
Chain Rule
Higher Order derivatives, Acceleration

Topic: Implicit Differentiation	**Duration:** 4 Day(s)

Topic Overview
Parametric Equations
Chain Rule in Parametic Form
Related Rates

Topic: The second derivative	**Duration:** 3 Day(s)

Topic Overview
Concavity
Second Derivative Test
Points of Inflection

Topic: Mean Value Theorem and Tangent Line Approximations	**Duration:** 3 Day(s)

Topic Overview
Using MVT and Tangent Line approximations

Unit: The Integral - definitions and applications	**Duration:** 9 Week(s)

Unit Overview
Understanding the integral and its relationship to the derivative.

Academic Vocabulary
Average Value of a Function
Riemann Sums
Integration
Anti Derivatives
First Fundamental Theorem of Calculus
Second Fundamental Theorem of Calculus
u-substitution

Topic: Basic Integration Rules	**Duration:** 4 Day(s)

Topic Overview
Integration Rules
U-substitution

Topic: Velocity Graphs	**Duration:** 6 Day(s)

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Topic Overview
Distance traveled vs displacement
Area Under the Curve
2nd Fundamental Theorem of Calculus

Topic: Riemann Sums	**Duration:** 6 Day(s)

Topic Overview
Left Hand
Right Hand
Trapezoidal
Riemann Sums to approximate
Equal and Unequal subdivisions

Topic: The Area Function	**Duration:** 6 Day(s)

Topic Overview
First Fundamental Theorem of Calculus
Area functions vs riemann sum
Area of discrete functions

Unit: Applications of Integration

Duration: 5 Week(s)

Unit Overview
Advanced application of integraion

Academic Vocabulary
Solids of Revolution - disks, washers
Logistics Curve
Differerntial Equations
Slope Fields

Topic: Volumes of solids with cross sections	**Duration:** 3 Day(s)

Topic Overview
Find the volume of solids with known cross-sections

Topic: Solids of Revolution	**Duration:** 6 Day(s)

Topic Overview
Disc Method
Washer Method

Topic: Differential Equations	**Duration:** 4 Day(s)

Topic Overview
Seperation of Variables
Initial Conditions

Topic: Slope Fields	**Duration:** 2 Day(s)

Topic Overview
Defining Slope Fields
Determining a function based upon the slope field

Unit: Review for AP Exam

Duration: 4 Week(s)

Unit Overview

Review all concepts and take practice exams using released AP material

Topic:	Duration: