

Advanced Placement

Calculus (for use with AP[®] courses)

AP[®] Calculus is a full-year, high school credit course that is intended for the student who has successfully mastered a minimum of four high school level mathematics courses that cover analytical and conceptual algebra (with heavy emphasis on functions), coordinate and plane geometry, and trigonometric functions. It is highly recommended that the student successfully complete pre-calculus as a prerequisite. The course primarily focuses on the skills and methods of analyzing graphical behavior of functions, the definition of a derivative as well as applications of derivatives, integration and their relationships with the graphical function.

Upon successfully completing the course, the student should have mastered the following concepts:

- Perform operations on functions including composition and inverses.
- Using calculation and estimation to evaluate limits.
- Analyze infinite limits and the correlation between their values and the graph's behavior; estimate and understand discontinuity and continuous functions.
- Compute the derivative of a function using the power rule, product and quotient rule, chain rule and all trigonometric rules.
- Use the concept of a derivative to interpret a function's rate of change and continuity; construct the equation of a line tangent to a curve; evaluate the intervals for which a function is increasing or decreasing.
- Interpret the Mean Value Theorem.
- Evaluate the second derivative and find the points of inflection.
- Utilize the derivative through application problems involving area under a curve, velocity, acceleration and speed.
- Evaluate a definite integral using the Fundamental Theorem of Calculus, Riemann Sums, and the rate of change formula.

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Unit 1: Graphs and Limits	
Assignments	
Calculus	1. Course Overview
	2. Course Introduction
	3. Fermat's Method Part 1
	4. Fermat's Method Part 2
	5. Graphs and Models
	6. Linear Models and Rates of Change
	7. Functions and Their Graphs
	8. Quiz 1 Review
	9. Quiz 1
	10. Calculus Preview
	11. Finding Limits Graphically and Numerically
	12. Epsilon-Delta Definition of a Limit
	13. Limit Proofs
	14. Evaluating Limits Analytically
	15. Squeeze Theorem with Trigonometry Review
	16. Quiz 2 Review
	17. Quiz 2
	18. Continuity and One-Sided Limits
	19. Intermediate Value Theorem
	20. Infinite Limits
	21. Chapter 1 Review
	22. Special Project*
	23. Chapter 1 Test

Unit 2: Derivatives	
Calculus	Assignments
	1. Definition of the Derivative
	2. Derivatives on the Graphing Calculator
	3. Drawing Derivatives
	4. Alternate Form of the Derivative
	5. Differentiation Rules
	6. Derivatives of Sine and Cosine
	7. Slope as a Rate of Change
	8. Quiz 3 Review
	9. Quiz 3
	10. Product Rule
	11. Quotient Rule
	12. Higher-Order Derivatives
	13. Chain Rule
	14. Implicit Differentiation
	15. Chapter 2 Review
	16. Special Project*
17. Chapter 2 Test	

Unit 3: Related Rates	
Calculus	Assignments
	1. Related Rates 1
	2. Related Rates 2
	3. Related Rates 3
	4. Related Rates 4
	5. Related Rates 5
	6. Related Rates Review
	7. Special Project*
8. Related Rates Test	

Unit 4: Derivative Tests	
Calculus	Assignments
	1. Extrema on an Interval
	2. Rolle's Theorem and the Mean Value Theorem
	3. First Derivative Test
	4. Quiz 4 Review
	5. Quiz 4
	6. Concavity and the Second Derivative Test
	7. Limits at Infinity
	8. Curve Sketching
	9. Chapter 3 Review
	10. Special Project*
	11. Chapter 3 Test
	12. Applied Max and Min Problems 1
	13. Applied Max and Min Problems 2
	14. Applied Max and Min Problems 3
	15. Linear Approximations
16. Differentials	

Unit 5: Review and Semester I Exam	
Calculus	Assignments
	1. Review
	2. Semester I Exam

Unit 6: Integrals	
Calculus	Assignments
	1. Antiderivatives and Integration
	2. Differential Equations
	3. Slope Fields
	4. Sigma Notation and Area
	5. Riemann Sums and the FTC
	6. Quiz 1 Review
	7. Quiz 1
	8. Mean Value Theorem and Average Value
	9. Integrating When the Curve Goes Below the x-axis
	10. Second Fundamental Theorem of Calculus
	11. Integration by Substitution
	12. Definite Integrals with Substitution
	13. Trapezoidal Rule
	14. Particle Movement
	15. Chapter 4 Review
	16. Special Project*
17. Chapter 4 Test	

Unit 7: Natural Logs and Functions	
Calculus	Assignments
	1. Review of the Natural Log and its Properties
	2. Natural Log Function and Differentiation
	3. Natural Log Function and Integration
	4. Integrating Trig Functions
	5. Quiz 2 Review
	6. Quiz 2
	7. Review of Inverse Functions
8. Exponential Functions	
9. Bases Other Than e	
10. Growth and Decay	
11. Chapter 5 Review	
12. Special Project*	
13. Chapter 5 Test	

Unit 8: Area and Volume	
Calculus	Assignments
	1. Area Between Two Curves
	2. Volumes of Revolution: The Disk Method
	3. Volumes of Revolution: The Disk and Washer
	4. Volumes of Solids with Known Cross Sections
5. Sections 6.1 and 6.2 Review	
6. Special Project*	
7. Sections 6.1 and 6.2 Test	

Unit 9: Inverse Trig Functions	
Calculus	Assignments
	1. Inverse Trig Functions
	2. Differentiating Inverse Trig Functions
	3. Integrating Inverse Trig Functions
4. Inverse Trig Functions Review	
5. Special Project*	
6. Inverse Trig Functions Test	

Unit 10: Review and Semester II Exam	
Calculus	Assignments
	1. Review
	2. Semester II Exam