

# AP Calculus AB – Course Details

## Full Year Course

### Course Objectives:

- Find and evaluate finite and infinite limits graphically, numerically, and analytically.
- Find derivatives using a variety of methods including The Chain Rule and Implicit Differentiation.
- Find extrema and apply Rolle's Theorem and the Mean Value Theorem.
- Use the First Derivative Test and The Second Derivative Test to analyze and sketch functions.
- Find antiderivatives using a variety of methods including substitution.
- Understand and apply Riemann sums, definite integrals, and The Fundamental Theorem of Calculus.
- Evaluate integrals using a variety of methods including substitution and numerical integration.
- Differentiate and integrate logarithmic, exponential, and inverse trigonometric functions.
- Solve simple differential equations that can be solved by separation of variables.
- Use simple differential equations that can be solved by separation of variables to solve applied problems.
- Use integration to determine the area between two curves, volume, and surface area.
- Apply integration to determine work, center of mass, and fluid force.

### Text:

All course material are accessed through the online course. No additional text is required.

### Course Outline:

#### Semester 1

##### Unit 1 - Course Overview

- Section 1 - Course Introduction
- Section 2 - Getting Started
- Section 3 - Research Papers

##### Unit 2 - Limits and Their Properties

- Section 1 - Limits and Their Properties: Introduction
- Section 2 - Linear Models and Rates of Change
- Section 3 - Functions, Graphs of Functions, and Finding Models to Data
- Section 4 - Finding Limits Graphically, Numerically, and Analytically
- Section 5 - Continuity, One-Sided Limits, and Infinite Limits
- Section 6 - Exam Preparation
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### Unit 3 - Differentiation

- Section 1 - Differentiation and Implicit Differentiation: Introduction
- Section 2 - The Derivative
- Section 3 - Differentiation
- Section 4 - Implicit Differentiation
- Section 5 - Exam Preparation

### Unit 4 - Applications of Differentiation

- Section 1 - Applications of Differentiation: Introduction
- Section 2 - Extrema and The Mean Value Theorem
- Section 3 - Derivative Tests, Limits, and Graphs
- Section 4 - Optimization, Newton's Method, and Differentials
- Section 5 - Exam Preparation

### Semester 1 Exam

### **Semester 2**

- Section 1 - Course Introduction
- Section 2 - Getting Started
- Section 3 - Research Papers

### Unit 6 - Integration

- Section 1 - Integration: Introduction
- Section 2 - Antiderivatives and Indefinite Integration
- Section 3 - Area, Riemann Sums, and Definite Integrals
- Section 4 - The Fundamental Theorem of Calculus
- Section 5 - Integration by Substitution and Numerical Integration
- Section 6 - Exam Preparation

### Unit 7 - Logarithmic, Exponential, and other Transcendental Functions

- Section 1 - Logarithmic, Exponential, and other Transcendental Functions: Introduction
- Section 2 - The Natural Logarithmic Function
- Section 3 - Inverse Functions and Exponential Functions
- Section 4 - Inverse Trigonometric Functions
- Section 5 - Hyperbolic Functions
- Section 6 - Exam Preparation

### Unit 8 - Differential Equations

- Section 1 - Differential Equations: Introduction
- Section 2 - Slope Fields, Euler's Method, and Growth and Decay
- Section 3 - Separation of Variables and First Order Linear Differential Equations
- Section 4 - Exam Preparation

### Unit 9 - Applications of Integration

- Section 1 - Applications of Integration: Introduction
- Section 2 - Area of a Region Between Two Curves
- Section 3 - Volumes, Arc Lengths, and Surfaces
- Section 4 - Work, Moments, and Fluids
- Section 5 - Exam Preparation

Semester 2 Exam

<b>Week by Week Course Breakdown</b>
<ul style="list-style-type: none"> <li>• Unit 1: Introduction</li> <li>• Unit 2: Limits and Their Properties: Sections 1, 2, 3, 4 and 5.</li> <li>• Read and study Chapter P, pages 2–7</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter P, pages 10–15</li> <li>• Unit 2 Quiz Yourself 1</li> <li>• Read and study Chapter P, Section P.3, pages 19–26</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter P, Section P.4, pages 31–33</li> <li>• Research Assignment: Science Application</li> <li>• Research Paper: Topic and Bibliography</li> </ul>
<ul style="list-style-type: none"> <li>• Unit 2 Quiz Yourself 2</li> <li>• Read and study Chapter 1, Section 1.1, pages 41–46</li> <li>• Read and study Chapter 1, Section 1.2, pages 48–54</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter 1, Section 1.3, pages 59–66</li> <li>• Writing Assignment: Properties of Limits</li> <li>• Research Paper: Thesis Statement</li> </ul>
<ul style="list-style-type: none"> <li>• Unit 2 Quiz Yourself 3</li> <li>• Read and study Chapter 1, Section 1.4, pages 70–78</li> <li>• Read and study Chapter 1, Section 1.5, pages 83–87</li> </ul>
<ul style="list-style-type: none"> <li>• Writing Assignment: Notation and Graphs</li> <li>• Discussion: End of Unit 2</li> <li>• Research Paper: Outline</li> </ul>
<ul style="list-style-type: none"> <li>• Unit 2 Quiz Yourself 4</li> <li>• Unit 2-Practice Exam</li> <li>• Unit 2 Exam</li> </ul>

- Unit 3: Differentiation: Sections 1, 2, 3, 4, and 5
- Read and study Chapter 2, Section 2.1, pages 96–103
- Read and study Chapter 2, Section 2.2, pages 107–114

- Writing Assignment: The Difference Quotient and The Derivative
- Research Paper: Rough Draft Part 1
- Unit 3 Quiz Yourself 1

- Read and study Chapter 2, Section 2.3, pages 119–125
- Read and study Chapter 2, Section 2.4, pages 130–136
- Research Assignment: Position, Velocity, and Acceleration

- Unit 3 Quiz Yourself 2
- Read and study Chapter 2, Section 2.5, pages 141–145
- Read and study Chapter 2, Section 2.6, pages 149–153

- Research Assignment: The Universe
- Discussion: Limits and Differentiation
- Research Paper: Rough Draft Part 1

- Unit 3 Quiz Yourself 3
- Unit 3-Practice Exam
- Unit 3 Exam

- Unit 4: Applications of Differentiation: Sections 1, 2, 3, 4, and 5
- Read and study Chapter 3, Section 3.1, pages 163–168
- Read and study Chapter 3, Section 3.2, pages 172–175

- Writing Assignment: Extrema
- Unit 4 Quiz Yourself 1

- Read and study Chapter 3, pages 179–185
- Read and study Chapter 3, pages 190–194

- Read and study Chapter 3, pages 198–204
- Read and study Chapter 3, pages 209–214

- Research Assignment: Precipitation
- Unit 4 Quiz Yourself 2

- Read and study Chapter 3, pages 218–222

<ul style="list-style-type: none"> <li>• Read and study Chapter 3, pages 229–232</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter 3, pages 235–239</li> <li>• Writing Assignment: Newton’s Method</li> </ul>
<ul style="list-style-type: none"> <li>• Research Paper: Final Paper</li> <li>• Unit 4 Quiz Yourself 3</li> </ul>
No tasks due
<ul style="list-style-type: none"> <li>• Unit 4-Practice Exam</li> <li>• Unit 4 Exam</li> </ul>
<ul style="list-style-type: none"> <li>• Semester 1 Exam: Introduction</li> <li>• Practice-Section 1 PartA</li> </ul>
<ul style="list-style-type: none"> <li>• Practice-Section 1 PartB</li> <li>• Practice-Section 2 PartA</li> </ul>
<ul style="list-style-type: none"> <li>• Practice-Section 2 PartB</li> <li>• Semester 1 Exam</li> </ul>

## **Semester 2**

<ul style="list-style-type: none"> <li>• Unit 6: Integration: Sections 1, 2, 3, 4, 5 and 6</li> <li>• Read and study Chapter 4, Section 4.1, pages 247–255</li> <li>• Writing Assignment: Antiderivatives and Derivatives</li> </ul>
<ul style="list-style-type: none"> <li>• Research Paper: Topic and Bibliography</li> <li>• Section 2 Quiz</li> <li>• Read and study Chapter 4, pages 259–267</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter 4, pages 271–278</li> <li>• Research Assignment: Riemann Sums and Area</li> <li>• Section 3 Quiz</li> </ul>
<ul style="list-style-type: none"> <li>• Read and study Chapter 4, pages 282–290</li> <li>• Writing Assignment: The Fundamental Theorem of Calculus</li> <li>• Research Paper: Thesis Statement</li> </ul>
<ul style="list-style-type: none"> <li>• Section 4 Quiz</li> </ul>

- Read and study Chapter 4, pages 295–303 and pages 309–313
- Read and study Chapter 4, pages 309–313

- Discussion: Integration, 100 points
- Research Paper: Outline
- Section 5 Quiz

- Unit 6-Practice Exam
- Unit 6 Exam
- Unit 7: Logarithmic, Exponential, and Other Transcendental Functions: Sections 1, 2, 3, 4, 5, and 6

- Read and study Chapter 5, pages 322–328
- Read and study Chapter 5, pages 332–337
- Research Assignment: The Number  $e$

- Research Paper: Rough Draft Part 1
- Section 2 Quiz
- Read and study Chapter 5, pages 341–346

- Read and study Chapter 5, pages 350–355
- Read and study Chapter 5, pages 360–365
- Research Assignment: Modeling Growth

- Section 3 Quiz
- Read and study Chapter 5, pages 371–376
- Read and study Chapter 5, pages 380–385

- Writing Assignment: Inverse Trigonometric Functions
- Section 4 Quiz
- Read and study Chapter 5, pages 388–396

No tasks due.

- Research Assignment: Suspension Bridges
- Discussion: Function and Inverse Function Pairs
- Section 5 Quiz

- Unit 7-Practice Exam
- Unit 7 Exam
- Unit 8: Differential Equations: Sections 1, 2, 3, and 4

- Read and study Chapter 6, pages 404–408
- Read and study Chapter 6, pages 413–417
- Research Assignment: Modeling Radioactive Decay

- Section 2 Quiz
- Read and study Chapter 6, pages 421–428
- Read and study Chapter 6, pages 432–438

- Discussion: Differential Equations
- Research Paper: Rough Draft Part 2
- Section 3 Quiz

- Unit 8-Practice Exam
- Unit 8 Exam
- Unit 9: Applications of Integration: Sections 1, 2, 3, 4, and 5

- Read and study Chapter 7, pages 446–451
- Section 2 Quiz
- Read and study Chapter 7, pages 456–458

- Read and study Chapter 7, pages 459–462
- Read and study Chapter 7, pages 467–471
- Read and study Chapter 7, pages 476–482

- Writing Assignment: Which Method and When?
- Section 3 Quiz
- Read and study Chapter 7, pages 487–492

- Read and study Chapter 7, pages 496–501
- Read and study Chapter 7, page 501, 503, 507–510

- Discussion: Work, Moments, and Fluids
- Research Paper: Final Paper

- Section 4 Quiz
- Unit 9-Practice Exam

No tasks due.

- Unit 9 Exam
- Semester 2 Exam: Introduction

- Practice AB Section 1, Part A
- Practice AB Section 1, Part B

- Practice AB Section II, Part A
- Practice AB Section II, Part B
- Semester 2 Exam Part 1
- Semester 2 Exam Part 2

AP Exam. Check [official AP schedule](#) for exact date.