

## High School Course Description for AP Calculus AB

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**Course Title:** Advanced Placement Calculus AB

**Curricular Area:** Mathematics

**Course Number:** MTH561

**Length:** One year

**Grade Level:** 10-12

**Prerequisites:**

Honors Pre-Calculus with grade of C or better OR

Trigonometry and Linear Algebra  
with a grade of B or better

**Meets a UC a-g Requirement:** "C" Area  
Mathematics and Increased Honors GPA

**Meets NCAA Requirement:** Yes

**Meets High School Graduation Requirement for:** Mathematics

### Course Description

This course provides students with college level Calculus instruction, a rigorous mathematics curriculum that will allow them to begin earning college credit. The course is designed to serve the needs of the college preparation student. This course covers all of the topics as outlined in the AP Calculus Course Description for Calculus AB as published by the College Board. All students enrolled in this course are expected to take the AP Calculus AB examination in May or complete a college-level project. ***Students earning a 4 or 5 on the AP exam will earn 1 semester college Calculus credit.***

(Note: Some universities accept a score of 3, 4, or 5 on the AP exam for college credit. Information about a particular university policy can be found at <http://collegesearch.collegeboard.com/apcreditpolicy/index.jsp>)

### Alignment

This course is aligned to the College Board standards for Advanced Placement Calculus AB.

### Instructional Materials

#### Required Textbook(s)

1. Calculus of a Single Variable.  
Larson, Hostetler, and  
Edwards; 8<sup>th</sup> edition 2006

#### Supplemental Materials

2. *Multiple Choice and Free Response Questions in Preparation for the AP Calculus AB Examination.*  
Lederman, David 8<sup>th</sup> ed. 2003

3. *AP Calculus Multiple Choice Questions;* 1969-1997

4. *AP Calculus Free Response Questions;* 1969-1978; 1979-1988; 1989-1998

5. *AP Calculus Free Response Questions; Posted by AP Central,* 1999-2007

6. *The Princeton Review: Cracking the AP Calculus AB and BC Exams;* Kahn, David, 2002-2003 edition

#### Web Sites

7. *Calculus in Motion*  
<http://www.calculusinmotion.com/>

#### Software

7. Geometer Sketchpad

### Exit Criteria

<u>Activities</u>	<u>Percentage</u>
Homework/ Classwork.....	20%
Tests/ Quizzes .....	60%
Final Examination.....	20%
Total:	100%

### Development Team

This Course of Study was updated in 2008 by Francisco Villegas (BHS) and Daniel Johnston (CHS)

## **First Semester: First Quarter**

### **Week 1: Class Basics and Expectations**

Schedule balancing, course expectations/syllabus, Use of textbook and graphing calculators

### **Weeks 2-3: Preparation for Calculus**

- Unit P-1 – Graphs and Models
- Unit P-2 – Linear Models and Rates of Change
- Unit P-3 – Functions and Their Graphs
- Unit P-4 – Fitting Models to Data
- Review and Assessment

### **Weeks 4-7: Limits and Their Properties**

- Unit 1.1 – A Preview of Calculus
- Unit 1.2 – Finding Limits Graphically and Numerically
- Unit 1.3 – Evaluating Limits Analytically
- Unit 1.4 – Continuity and One-Sided Limits
- Unit 1.5 – Infinite Limits
- Unit 3.5 – Limits at Infinity
- Review and Assessment

### **Weeks 8-10: Differentiation**

- Unit 2.1 – The Derivation and Tangent Line Problem
- Unit 2.2 – Basic Differentiation Rules and Rates of Change
- Unit 2.3 – Product and Quotient Rules and Higher-Order Derivations
- Unit 2.4 – The Chain Rule
- Unit 2.5 – Implicit Differentiation

## **First Semester: Second Quarter**

### **Week 11: Differentiation (Continued)**

- Unit 2.5 – Implicit Differentiation (continued)
- Unit 2.6 – Related Rates
- Review and Assessment

### **Weeks 12-15: Applications of Differentiation**

- Unit 3.1 – Extrema on an Interval
- Unit 3.2 – Rolle's Theorem and the Mean Value Theorem
- Unit 3.3 – Increasing and Decreasing Functions and The First Derivation Test
- Unit 3.4 – Concavity and The Second Derivation Test
- Unit 3.6 – A Summary of Curve Sketching
- Unit 3.7 – Optimization Problems
- Unit 3.9 – Differentials
- Review and Assessment

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**First Semester: Second Quarter (continued)**

**Weeks 16 – 18: Integration**

- Unit 4.1 – Antiderivatives and Indefinite Integration
- Unit 4.2 – Area
- Unit 4.3 – Riemann Sums and Definite Integrals
- Unit 4.4 – The Fundamental Theorem of Calculus
- Unit 4.5 - Integration by Substitution
- Unit 4.6 – Numerical Integration
- Review and Assessment

**Second Semester: Third Quarter**

**Weeks 1-4: Logarithmic, Exponential and Other Transcendental Functions**

- Unit 5.1 – The Natural Logarithmic Function: Differentiation
- Unit 5.2 – The Natural Logarithmic Function: Integration
- Unit 5.3 – Inverse Functions
- Unit 5.4 – Exponential Functions: Differentiation and Integration
- Unit 5.5 – Bases Other than  $e$  and Applications
- Unit 5.6 – Inverse Trigonometric Functions: Differentiation
- Unit 5.7 – Inverse Trigonometric Functions: Integration
- Review and Assessment

**Weeks 5-6: Differential Equations**

- Unit 6.1 – Slope Fields and Euler’s Method
- Unit 6.2 – Differential Equations: Growth and Decay
- Unit 6.3: - Separation of Variables and the Logistic Function

**Weeks 7-8: Application of Integration**

- Unit 7.1 – Area of a Region Between Two Curves
- Unit 7.2 – Volume: The Disk Method/ The Washer Method & Known Cross Sections
- Unit 8.1 – Basic Integration Rules
- Review and Assessment

**Week 9: AP Examinations- Review**

**Week 10: Applications of Differentiation**

- Unit 3.8 – Newton’s Method

Pacing Guide Continued Next Page

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**Second Semester: Fourth Quarter**

**Weeks 11-14: Applications of Integrations**

- Unit 7.3 – Volume: The Shell Method
- Unit 7.4 – Arc Length and Surfaces of Revolution
- Unit 7.5 – Work
- Unit 7.6 – Moments, Centers of Mass, and Centroids
- Unit 7.7 – Fluid Pressure and Fluid Force

**Weeks 15-17: Integration Techniques, L'Hopital's Rule, and Improper Integrals**

*(Final Units covered as time permits)*

- Unit 8.2 – Integration by Parts
- Unit 8.3 – Trigonometric Integrals
- Unit 8.4 – Trigonometric Substitution
- Unit 8.5 – Partial Fractions
- Unit 8.6 – Integration by Tables and Other Integration Techniques
- Unit 8.7 – Indeterminate Forms and L'Hopital's Rule
- Unit 8.8 – Improper Integrals

**Weeks 18- 19: Final Exams- AP Calculus AB District Final Examination**

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**Learning Experiences and Instruction**

Homework topics are presented graphically, numerically, analytically, and verbally and the connection between these representations is emphasized.

Direct Instruction is the primary method of instruction:

*Technology Integration to Advance Instruction and Student Comprehension:*

- Geometer Sketchpad Software
- TI-89 Graphing Calculator
- Applicable Web Application: *Calculus in Motion*

**Support for English Language Learners:**

Teachers will supplement with universal access materials from SB 472 training including word walls, visual aides, and graphic organizers. Additional instruction in academic and content vocabulary is provided to increase access to rigorous curriculum for limited English speakers.

**Support for Special Education Students:**

High math-functioning RSP students may be appropriately placed in this course. Teachers will supplement with universal access materials from SB 472 training including word walls, visual aides, and graphic organizers. Core teacher collaboration with Resource Teacher on assessment, progress reporting, and semester grades is required.

**GATE Students:**

This course is an appropriate instructional model for GATE students, incorporating a rigorous curriculum with instructional support for student success.