

High School Course Description for AP Calculus AB

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; 8th edition 2006

Supplemental Materials

2. *Multiple Choice and Free Response Questions in Preparation for the AP Calculus AB Examination.*
Lederman, David 8th 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

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

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Pacing Guide for AP Calculus AB

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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Instructional Guides for AP Calculus AB

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.