High School Course Description for **AP Calculus AB**

Course Title: Advanced Placement Calculus AB

Course Number: MTH561

Grade Level: 10-12

Curricular Area: Mathematics

Length: One year

Prerequisites:

Honors Pre-Calculus with grade of C or better <u>OR</u>

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

<u>Required Textbook(s)</u>
1. <u>Calculus of a Single Variable.</u>
   Larson, Hostetler, and
   Edwards; 8th edition 2006

<u>Supplemental Materials</u>
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

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

<u>Software</u>
   7.   Geometer Sketchpad

Exit Criteria

Activities	Percentage
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)

Secondary Curriculum Council Approved: 1/13/09

Pacing Guide for **AP Calculus AB**

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

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

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.