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

Course Title: Advanced Placement Calculus BC

Curricular Area: Mathematics

Course Number: MTH563

Length: One year – Double Block Period

Grade Level: 10-12

Prerequisites:

Honors Pre-Calculus with 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 BC as published by the College Board. All students enrolled in this course are expected to take the AP Calculus BC examination in May or complete a college-level project. ***Students earning a 4 or 5 on the AP exam will earn 1 year 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

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)

Pacing Guide for **AP Calculus BC**

First Semester: First Quarter

Week: 1: Class Basics and Expectations
Schedule balancing, course expectations/syllabus, Use of textbook and graphing calculators

Weeks 2-4: 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 5-6: 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
> Unit 2.6 – Related Rates
> > Review and Assessment

Weeks 7-9: 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

Week 10: Integration
> Unit 4.1 – Antiderivatives and Indefinite Integration
> Unit 4.2 – Area
> Unit 4.3 – Riemann Sums and Definite Integrals

First Semester: Second Quarter

Week 11-12: Integration (continued)
> Unit 4.4 – The Fundamental Theorem of Calculus
> Unit 4.5 - Integration by Substitution
> Unit 4.6 – Numerical Integration
> > Review and Assessment

Pacing Guide for **AP Calculus BC**

First Semester: Second Quarter (continued)

Weeks 13-15: 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 16-17: 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
    Review and Assessment

Week 18: 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 7.3 – Volume: The Shell Method (optional- may be used on AP Exam)

Week 19: Semester Final Examinations
  Students complete the AP Calculus BC District Semester Examination

Second Semester: Third Quarter

Week 1: Application of Integration *(continued)*
  Unit 7.4 – Arc Length and Surfaces of Revolution
  Unit 7.5 – Work (Optional)
  Unit 7.6 – Moments, Centers of Mass, and Centroids (Optional)
  Unit 7.7 – Fluid Pressure and Fluid Force (Optional)
  Unit 8.1 – Basic Integration Rules
    Review and Assessment

Weeks 2-3: Integration Techniques, L'Hopital's Rule, and Improper Integrals
  Unit 8.1 – Basic Integration Rules
  Unit 8.2 – Integration by Parts
  Unit 8.5 – Partial Fractions
  Unit 8.7 – Indeterminate Forms and L'Hopital's Rule
  Unit 8.8 – Improper Integrals
    Review and Assessment

Second Semester: Third Quarter *(Continued)*

Weeks 4-7: Infinite Series
>   Unit 9.1 – Sequences
>   Unit 9.2 – Series and Convergence
>   Unit 9.3 – The Integral Test and *p*-series
>   Unit 9.4 – Comparisons of Series
>   Unit 9.5 – Alternating Series
>   Unit 9.6 – The Ration and Root Tests
>   Unit 9.7 – Taylor Polynomials and Approximations
>   Unit 9.8 – Power Series
>   Unit 9.9 – Representation of Functions by Power Series
>   Unit 9.10 – Taylor and Maclaurin Series
>   Review and Assessment

Weeks 9-10: Conics, Parametric Equations, and Polar Coordinates
>   Unit 10.2 – Plane Curves and Parametric Equations
>   Unit 10.3 – Parametric Equations and Calculus
>   Unit 10.4 – Polar Coordinates and Polar Graphs
>   Unit 10.5 – Area and Arc Length in Polar Coordinates
>   Review and Assessment

Second Semester: Fourth Quarter

Weeks 11-12: Vectors and the Geometry of Space
>   **Vector-Valued Functions**
>   Unit 11.1 – Vectors in the Plane
>   Unit 12.1 – Vector-Valued Functions
>   Unit 12.2 – Differentiation and Integration of Vector-Valued Functions
>   Unit 12.3 – Velocity and Acceleration
>   Review and Assessment

Week 13-14: Review and AP Testing

Week 15: Applications of Differentiation
>   Unit 3.8 – Newton's Method

Weeks 16-17: Applications of Integrations
(Optional Prior to AP Exam- Cover Remaining Now as Time Permits)
>   Unit 7.3 – Volume: The Shell Method
>   Unit 7.5 – Work
>   Unit 7.6 – Moments, Centers of Mass, and Centroids
>   Unit 7.7 – Fluid Pressure and Fluid Force

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:
Extremely 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.

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Secondary Curriculum Council Approved: 1/13/09
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