FORM IV AP© CALCULUS AB

Textbook:
   Calculus: Early Transcendentals, 7th Edition
   Stewart
   2012, Brooks/Cole.

Pre-Requisites:
Students have the best chance of success if they have earned at least 85% in all four quarters of the junior math course. The document entitled "Pre-Requisite Skills for AP Calculus" outlines the specific skills that students should master before enrolling in this course.

Course Description:
AP Calculus AB covers the material included in the first semester of a college calculus course.   The course is fast-paced and intensive and requires a solid commitment of time from each student. The first few weeks of the course solidify fundamental mathematical concepts that are required in calculus. The remainder of the course addresses the topics that are on the AP Calculus AB Exam.

Calculator Policy:
A TI-84 Silver Edition is required for this course. During the course, students will use the calculator for investigations and to solve problems. Students will be expected to understand how to solve some problems both without the calculator and with the calculator.   However, students should not expect to be able to use their calculator on every quiz, test, and homework assignment.

Course Goals:
   1. To cover course content in a way that meets the following goals (as defined by the College Board):

      a. Students should be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.
      b. Students should understand the meaning of derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems.
      c. Students should understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change and should be able to use integrals to solve a variety of problems.
      d. Students should understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
      e. Students should be able to communicate mathematics both orally and in well-written sentences and should be able to explain solutions to problems.
      f. Students should be able to model a written description of a physical situation with a function, a differential equation, or an integral.
      g. Students should be able to use technology to help solve problems, experiment, interpret results, and verify conclusions.

   h. Students should be able to determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.

   i. Students should develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.

2. To prepare students for the AP Calculus AP Exam.

3. To expose students to a variety of technology (graphing calculators, web applications, Maple, etc.) so that they learn how and when to use technology to solve both "contrived" and real-world problems, what to watch out for when using technology, and how to interpret the answer(s) that technology provides.

Course Sequence:

The College Board has provided a list of topics that are to be covered in an AP Calculus AB Course. We will address each one of those topics, in the following order.

A. **What is Calculus?**
   Brief history of mathematics, including the creation of the calculus

B. **Chapter 1 – Functions and Models (Review)**
   1.1 – Four Ways to Represent a Function
   1.2 – Mathematical Models: A Catalog of Essential Functions
   1.3 – New Functions from Old Functions
   1.4 – Graphing Calculators and Computers
   1.5 – Exponential Functions
   1.6 – Inverse Functions and Logarithms

C. **Chapter 2 – Limits and Derivatives**
   2.1 – Tangent and Velocity Problems
   2.2 – The Limit of a Function
   2.3 – Calculating Limits Using the Limit Laws
   2.5 – Continuity
   2.6 – Limits at Infinity; Horizontal Asymptotes
   2.7 – Derivatives and Rates of Change
   2.8 – The Derivative as a Function

D. **Chapter 3 – Differentiation Rules**
   3.1 – Derivatives of Polynomials and Exponential Functions
   3.2 – The Product and Quotient Rules
   3.3 – Derivatives of Trigonometric Functions
   3.4 – The Chain Rule
   3.5 – Implicit Differentiation
   3.6 – Derivatives of Logarithmic Functions
   3.7 – Rates of Change in the Natural and Social Sciences
   3.8 – Exponential Growth and Decay
   3.9 – Related Rates
   3.10 – Linear Approximations and Differentials

E. **Chapter 4 – Applications of Differentiation**
   4.1 – Maximum and Minimum Values
   4.2 – The Mean Value Theorem
   4.3 – How Derivatives Affect the Shape of a Graph
   4.4 – Indeterminate Forms and l'Hospital's Rule
   4.5 – Summary of Curve Sketching

4.6 – Graphing with Calculus and Calculators
4.7 – Optimization Problems
4.8 – Newton's Method
4.9 – Antiderivatives
F. **Chapter 5 – Integrals**
5.1 – Areas and Distances
7.7 – Trapezoid Rule
5.2 – The Definite Integral
5.3 – The Fundamental Theorem of Calculus
5.4 – Indefinite Integrals and the Net Change Theorem
5.5 – The Substitution Rule
G. **Chapter 6 – Applications of Integration**
6.1 – Areas Between Curves
6.2 – Volumes
6.3 – Volumes by Cylindrical Shells (if time allows)
6.5 – Average Value of a Function
H. **Chapter 9 – Differential Equations**
9.1 – Modeling with Differential Equations
9.2 – Direction Fields and Euler's Method
9.3 – Separable Equations
I. **Review for AP Exam**
Review Course Content, AP Exam Tips, and practice AP Exam problems
J. **Post-AP Exam Topics**
To be determined on a yearly basis.

Evaluation: Students are evaluated through:
- **Participation**: Participation is demonstrated through asking & answering questions, volunteering to present problems on the board, and being actively engaged in class.
- **Homework**: Homework will be assigned almost daily to be collected the following day, and will generally have two parts: the first part will cover material learned that day, and this will be graded for completeness. The second part of the homework will consist of a few problems from the previous day's lesson. These problems will be graded for correctness.
- **Old AP exam free response questions**: Assigned throughout the year as homework; students will have a few days to work on these.
- **Quizzes**: Quizzes may be announced or unannounced. About 1 quiz before each test, although longer units may have 2.
- **Tests**: There will be 3 tests per quarter. The semester exams at the end of the 2nd and 4th quarters count for two test grades.

Supplemental Materials:
Multiple Choice and Free-Response Questions in Preparation for the AP Calculus (AB) Examination, Eighth Edition, by David Lederman. The school owns copies of these books. Students use them in preparation for the AP exam.