

## High School—Advanced Placement (AP)

### Calculus AB Calculus BC

*Note: Since AP Course Descriptions are updated regularly, please visit AP Central® ([apcentral.collegeboard.org](http://apcentral.collegeboard.org)) to determine whether a more recent Course Description is available.*

AP courses in Calculus consist of a full high school academic year of work, and are one-credit courses comparable to calculus courses in colleges and universities. It is expected that students who take an AP course in calculus will seek college credit, college placement, or both from institutions of higher learning.

The AP Program includes specifications for two calculus courses and the exam for each course. The two courses and the two corresponding exams are designated as Calculus AB and Calculus BC.

**Calculus AB** can be offered as an AP course by any school that can organize a curriculum for students with mathematical ability. Calculus AB is designed to be taught over a full high school academic year. It is possible to spend some time on elementary functions and still teach the Calculus AB curriculum within a year. However, if students are to be adequately prepared for the Calculus AB Exam, most of the year must be devoted to the topics in differential and integral calculus. These topics are the focus of the AP Exam questions.

**Calculus BC** is a full-year course in the calculus of functions of a single variable. It includes all topics taught in Calculus AB plus additional topics, but both courses are intended to be challenging and demanding; they require a similar depth of understanding of common topics.

A *Calculus AB* subscore is reported based on performance on the portion of the Calculus BC Exam devoted to Calculus AB topics. Both courses described here represent college-level mathematics for which most colleges grant advanced placement and/or credit. Most colleges and universities offer a sequence of several courses in calculus, and entering students are placed within this sequence according to the extent of their preparation, as measured by the results of an AP Exam or other criteria. Appropriate credit and placement are granted by each institution in accordance with local policies.

The content of *Calculus BC* is designed to qualify the student for placement and credit in a course that is one course beyond that granted for Calculus AB. Many colleges provide statements regarding their AP policies in their catalogs and on their websites.

## High School—Advanced Placement (AP) (continued)

### Calculus AB Calculus BC

Success in AP Calculus is closely tied to the preparation students have had in courses leading up to their AP courses. Students should have demonstrated mastery of material from courses that are the equivalent of four full years of high school mathematics before attempting calculus. These courses should include the study of algebra, geometry, coordinate geometry, and trigonometry, with the fourth year of study including advanced topics in algebra, trigonometry, analytic geometry, and elementary functions. Even though schools may choose from a variety of ways to accomplish these studies — including beginning the study of high school mathematics in grade 8; encouraging the election of more than one mathematics course in grade 9, 10, or 11; or instituting a program of summer study or guided independent study — it should be emphasized that eliminating preparatory course work in order to take an AP course is not appropriate.

Calculus AB and Calculus BC are primarily concerned with developing the students' understanding of the concepts of calculus and providing experience with its methods and applications. The courses emphasize a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The connections among these representations also are important.

Technology should be used regularly by students and teachers to reinforce the relationships among the multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results. Through the use of the unifying themes of derivatives, integrals, limits, approximation, and applications and modeling, the course becomes a cohesive whole rather than a collection of unrelated topics. These themes are developed using all the functions listed in the prerequisites.

#### Goals of AP Calculus AB and AP Calculus BC:

- 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.
- Students should understand the meaning of the 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.
- 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.

## High School—Advanced Placement (AP) (continued)

### Calculus AB

### Calculus BC

- Students should understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Students should be able to communicate mathematics and explain solutions to problems both verbally and in written sentences.
- Students should be able to model a written description of a physical situation with a function, a differential equation, or an integral.
- Students should be able to use technology to help solve problems, experiment, interpret results, and support conclusions.
- Students should be able to determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- Students should develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.

### AP Central® ([apcentral.collegeboard.org](http://apcentral.collegeboard.org))

Interested parties can find the following Web resources at AP Central:

- AP Course Descriptions, information about the AP Course Audit, AP Exam questions and scoring guidelines, sample syllabi, and feature articles.
- A searchable Institutes and Workshops database, providing information about professional development events.
- The Course Home Pages ([apcentral.collegeboard.org/course\\_homepages](http://apcentral.collegeboard.org/course_homepages)), which contain articles, teaching tips, activities, lab ideas, and other course-specific content contributed by colleagues in the AP community.
- Moderated electronic discussion groups (EDGs) for each AP course, provided to facilitate the exchange of ideas and practices.

### Additional Resources

Teacher's Guides and Course Descriptions may be downloaded free of charge from AP Central; printed copies may be purchased through the College Board Store ([store.collegeboard.org](http://store.collegeboard.org)).