

# AP CALCULUS BC

*Ivy Collegiate School*

2022-2023

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<b>Department:</b> Mathematics	<b>Time:</b> MTuW 11:20 – 12:20
<b>Email:</b> <a href="mailto:mathematics@ivycollegiateschool.org">mathematics@ivycollegiateschool.org</a>	<b>Place:</b> Seminar.

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**Course References:** This is a list of various interesting and useful books and online resources that were used in the construction of the course. You are not required to purchase any of these, but they may be useful for occasional consultation. (Note: They are available in the restricted library.)

- James Stewart, *Essential Calculus: Early Transcendentals*, Cengage Learning, 1st ed., 2010.
- Deborah Hughes-Hallett, *Calculus: Single & Multivariable*, Wiley, 6th ed., 2013.
- David Bock, Dennis Donovan, and Shirley Hockett *Barron's AP Calculus*, Barrons Educational Series, 15th ed., 2019.
- AP Calculus BC Class of 2019 *AP Calculus BC Study Guide*, Ivy Collegiate School, 2019.

**Objectives:** This course is the second course in Calculus at Ivy Collegiate School, and also the second Calculus course in the AP curriculum. Following successful completion of AP Calculus AB, students develop their understanding of differential and integral calculus by learning a more diverse set of techniques for evaluating a variety of classes of functions and relations. The first half of the course is devoted to exposing students to the wide range of applications and methods of single-variable calculus, while the second half of the course introduces students to the key topics involved in working with sequences and series, such as power series, Taylor series (Maclaurin series), and the Lagrange Error Bound. While some of the topics covered in this course were previously introduced in the AP Calculus AB course, they will be developed more fully with greater difficulty and rigor in this course. As in the AB course, this course also emphasizes the many applications of calculus to such varied fields as physics, biology, economics, and the social sciences. This course is comprised of four "Big Ideas":

- BIG IDEA #1: Limits & Continuity
- BIG IDEA #2: Derivatives
- BIG IDEA #3: Integrals & the Fundamental Theorem of Calculus
- BIG IDEA #4: Sequences & Series

Students who are successful in this course are recommended to proceed to the Multivariable Calculus and Linear Algebra & Differential Equations courses in the future to further explore the enormous potential of calculus to solving a growing range of problems.

**Co-/Prerequisites:** AP Calculus AB

**Notes on AP courses:** AP courses culminate in an examination May with scores ranging from 1 to 5 (5 - Extremely well-qualified; 4 - Well-qualified; 3 - Qualified; 2 - Somewhat qualified; 1 - Not qualified). Students are expected to devote additional time beyond their normal class and homework hours to preparing for this examination. While time for instructor-led review is always allotted during the Spring semester, it is important that students begin their review independently and early. At ICS, AP courses have an additional

component in the requirement of the completion of a Capstone Project at the end of the year (in lieu of a traditional Final Examination). More details regarding the Capstone Project(s) may be found below.

### AP Calculus AB Course Outline:

Week One	Parametric curves
Week Two	Polar equations and derivatives
Week Three	Vector-valued functions
Week Four	Integration by parts
Week Five	Partial fraction decomposition
Week Six	Improper integrals
Week Seven	Arc length
Week Eight	Integrating parametric, polar, and vector functions
Week Nine	Logistic differential equations
Week Ten	Euler's Method
Week Eleven	Introduction to sequences and series
Week Twelve	Types of series
Week Thirteen	Convergence tests
Week Fourteen	Alternating series
Week Fifteen	REVIEW
Week Sixteen	Power series
Week Seventeen	Taylor series
Week Eighteen	Operations on series
Week Nineteen	Lagrange error bounds
Week Twenty to Thirty-two	SPRING REVIEW PERIOD
Week Thirty-three to Thirty-seven	CAPSTONE RESEARCH
Week Thirty-eight	CAPSTONE PRESENTATIONS

**Grading Policy:** Homework and quizzes (60%), Finals and Project (40%)

**Capstone Project:** The Capstone projects are designed to give you the opportunity to showcase (beyond the examination) what you have learned and the skills you have mastered as part of the course. While every project assignment may be different in scope, target, grading, and type of organization, each is intended to require you to “dig deep” and impress us with your creativity. For this set of courses, you are required to submit a project that captures the full-depth of your knowledge of select topic(s) from the course. Examples may include writing an original research paper related to a topic you have learned in class, producing a 30-minute video tutorial on a select topic, or developing a programming project related to a concept from the course. Rubrics will be available in the Spring semester.

### Important Dates:

Final Examination, Semester I	Dec 2022
AP Examination	May 8, 2023
Capstone Deadline	TBD

### Course Policy:

- A TI-NSpire CX-CAS is required.
- It is recommended that you refer to the Class of 2019's *AP Calculus BC Study Guide* for additional review.

### Class Policy:

- Regular attendance is essential and expected.
- All assignments should be submitted with complete worked-out solutions.

**Academic Honesty:** Students are expected to abide by the policies regarding Academic Honesty as laid out in the ICS Student Handbook. Any violations will be forwarded for administrative review and the possible imposition of academic penalties.