AP Calculus AB/BC
Summer Assignment

This summer assignment is intended to be an **independent assignment** to review the prerequisite topics that are needed for AP® Calculus. This assignment will also be a useful guide to refer to topics within algebra, geometry, trigonometry and function analysis. **In the first section, follow the instructions to complete the problem set through DeltaMath. In the following section, you will see a list of prerequisite topics as well as resources where you can review these specific topics.**

I. DeltaMath Assignment

In order to complete the AP Calculus Summer Assignment, you will need to create a student account at www.deltamath.com using a personal email. It is easy and free to create an account. When you create your account, use the teacher code **117874** to join the "Summer Assignment '23-'24" class**.** This will "enroll" you in Mrs. Rodgers' class and allow you access to the Summer Assignment. This does not mean that Mrs. Rodgers will be your calculus teacher for the year!

For each problem, you will get two attempts. If your first attempt is incorrect, you will be instructed to double check your work and correct your mistake. If it is wrong on the second attempt, you will not receive credit for that problem and it will show you the correct solution and approach. To get full credit for the problem set, you can continue to do problems until you get full points (lost points are not lost forever!). Even if you receive full points, you can continue to practice until you feel confident on that skill. Know yourself and how much practice **you** need to be ready!

This assignment itself WILL NOT count as a class grade. However, you will be responsible for knowing these concepts. Build these skills now and come armed with questions to make sure you are ready to use these pre-requisite skills on an assessment at the beginning of the school year!

It is most important that you come into this class with an excellent work ethic and the desire to do well.

DURING THE YEAR, YOU WILL BE GIVEN A LOT OF TIME IN CLASS TO WORK PROBLEMS. IT IS AN EXPECTATION THAT YOU WILL USE THE TIME GIVEN TO YOU WISELY. PLEASE GET IT INTO YOUR MIND THAT THIS CLASS IS NOT A STUDY HALL FOR OTHER CLASSES OR A NAP TIME. YOU ARE EXPECTED TO SHOW UP EVERY DAY AND USE THE TIME IN CLASS FOR CALCULUS.

Enjoy your summer. Come back with a great attitude and work ethic, and you will do well!

AP Calculus AB/BC
Summer Assignment

After completing the DeltaMath, you may still have weaknesses in certain areas that should be reviewed further. See a list of prerequisite topics as well as resources where you can review these specific topics below. In addition to DeltaMath problems and videos, these resources may be helpful in making sure you have all the necessary skills for Calculus.

II. Prerequisite Topics and Resources

Directions: Review the table of prerequisite topics. Resources have been provided for each topic if any review or explanation is necessary. This table of topics and resources serves as an excellent primer to the AP® Calculus courses.

Algebra

Topic	Resource
Equation of a line	Write the Equation of a Line
Rational expressions	Simplify Rational Expressions
Functions: domain/range	Determine Domain and Range from Graphs Determine Domain of Advanced Functions
Functions: compositions	Find Composite Functions Evaluate Composite Functions Using Tables
Functions: inverses	Find Inverse Functions Verify Inverse Functions

Geometry

Topic	Resource
Area Formulas	Area of Triangles Area of Equilateral Triangle Area of Circle
Volume and Surface Area Formulas	Chart of Volume and Surface Area of a Sphere, Cube, Rectangular Solid and Cone
Similar Triangles	Solve Similar Triangles

Prerequisite Topics and Resources (cont.)

Trigonometry

Topic	Resource
Sum and Difference Formulas	Using Sum and Difference Formulas
Double-Angle Formulas	Using Double-Angle Formulas
Trigonometric Identities	Pythagorean Identities Reciprocal and Quotient Identities
Unit Circle	Special Points on the Unit Circle Unit Circle Generating Trigonometric Graphs
Trigonometric Graphs	Graphs of Sine and Cosine Graphs of Tangent and Reciprocal Functions

Functions

Topic	Resource
Linear Functions	Math Is Fun: Linear Equations
Polynomial Functions	Math Is Fun: Polynomial Functions
Rational Functions	Graphs of Rational Functions: Horizontal Asymptotes Graphs of Rational Functions: Vertical Asymptotes
Exponential Functions	Exponential Function and Its Graph
Logarithmic Functions	Logarithmic Functions and Its Graph
Trigonometric Functions	Math Is Fun: Trigonometric Functions
Inverse Trigonometric Functions	Inverse Trigonometric Functions and Their Graphs
Piecewise Functions	Piecewise Functions and Their Graphs Absolute Value Function as a Piecewise Defined Function

AP Calculus AB/BC
Summer Assignment

I N T R O D U C T I O N

AP courses in calculus consist of a full high school academic year of work and are 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. This curriculum should include all the prerequisites for a year's course in calculus listed [below]. 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 cover 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...**

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 covering 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. **The AP Calculus Development Committee recommends that calculus should be taught as a college-level course. With a solid foundation in courses taken before AP, students will be prepared to handle the rigor of a course at this level. Students who take an AP Calculus course should do so with the intention of placing out of a comparable college calculus course. This may be done through the AP Exam, a college placement exam, or any other method employed by the college**

Philosophy

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 multirepresentational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The connections among these representations also are important.

Broad concepts and widely applicable methods are emphasized. The focus of the courses is neither manipulation nor memorization of an extensive taxonomy of functions, curves, theorems, or problem types. Thus, although facility with manipulation and computational competence are important outcomes, they are not the core of these courses. 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.

Goals

• 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.
(There are other calculus based goals not listed here for the purpose of brevity)

U S E   O F   G R A P H I N G   C A L C U L AT O R S

Professional mathematics organizations such as the National Council of Teachers of Mathematics, the Mathematical Association of America, and the Mathematical Sciences Education Board of the National Academy of Sciences have strongly endorsed the use of calculators in mathematics instruction and testing. The use of a graphing calculator in AP Calculus is considered an integral part of the course. Students should use this technology on a regular basis so that they become adept at using their graphing calculators. Students should also have experience with the basic paper-and-pencil techniques of calculus and be able to apply them when technological tools are unavailable or inappropriate. The AP Calculus Development Committee understands that new calculators and computers capable of enhancing the teaching of calculus continue to be developed. There are two main concerns that the committee considers when deciding what level of technology should be required for the exams: equity issues and teacher development.

Graphing Calculator Capabilities for the Exams

The committee develops exams based on the assumption that all students have access to four basic calculator capabilities used extensively in calculus. A graphing calculator appropriate for use on the exams is expected to have the built-in capability to:
1) plot the graph of a function within an arbitrary viewing window,
2) find the zeros of functions (solve equations numerically),
3) numerically calculate the derivative of a function, and
4) numerically calculate the value of a definite integral.

One or more of these capabilities should provide the sufficient computational tools for successful development of a solution to any exam question that requires the use of a calculator. Care is taken to ensure that the exam questions do not favor students who use graphing calculators with more extensive built-in features. Students are expected to bring a calculator with the capabilities listed above to the exams. AP teachers should check their own students' calculators to ensure that the required conditions are met. A list of acceptable calculators can be found at AP Central. If a student wishes to use a calculator that is not on the list, the teacher must contact the AP Program (609 771-7300) before April 1 of the testing year to request written permission for the student to use the calculator on AP Exams.

Technology Restrictions on the Exams

Nongraphing scientific calculators, computers, devices with a QWERTY keyboard, and pen-input/stylus-driven devices or electronic writing pads are not permitted for use on the AP Calculus Exams. Test administrators are required to check calculators before the exam. Therefore, it is important for each student to have an approved calculator. The student should be thoroughly familiar with the operation of the calculator he or she plans to use. Calculators may not be shared, and communication between calculators is prohibited during the exam. Students may bring to the exam one or two (but no more than two) graphing calculators from the approved list.

THE EXAMS

The Calculus AB and BC Exams seek to assess how well a student has mastered the concepts and techniques of the subject matter of the corresponding courses. Each exam consists of two sections, as described below.
Section I: a multiple-choice section testing proficiency in a wide variety of topics
Section II: a free-response section requiring the student to demonstrate the ability to solve problems involving a more extended chain of reasoning.
The time allotted for each AP Calculus Exam is 3 hours and 15 minutes. The multiple-choice section of each exam consists of 45 questions in 105 minutes. **Part A of the multiple-choice section (30 questions in 60 minutes) does not allow the use of a calculator.** Part B of the multiple-choice section (15 questions in 45 minutes) contains some questions for which a graphing calculator is required. The free-response section of each exam has two parts: one part requiring graphing calculators, **and a second part not allowing graphing calculators**. The AP Exams are designed to accurately assess student mastery of both the concepts and techniques of calculus. The two-part format for the free-response section provides greater flexibility in the types of problems that can be given while ensuring fairness to all students taking the exam, regardless of the graphing calculator used.

Prerequisites

Before studying calculus, all students should complete four years of secondary mathematics designed for college-bound students: courses in which they study algebra, geometry, trigonometry, analytic geometry, and elementary functions. These functions include linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, and piecewise-defined functions. In particular, before studying calculus, students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, and so on) and know the values of the

trigonometric functions at the numbers 0, $\dfrac{\pi}{6}, \dfrac{\pi}{4}, \dfrac{\pi}{3}, \dfrac{\pi}{2}$ and their multiples.