

## Mr. Milazzo's AP Calculus Syllabus

Welcome to your first college mathematics course! It is very important that everyone leaves this class with a strong knowledge of Calculus, in preparation to be successful in college mathematics courses. However, the ultimate goal of this course is the preparation for the AP Calculus BC exam, which will take place during the first two weeks of May. This course will be designed with the AP exam in mind. The content of this course will parallel what you would see in a first semester and second semester of college Calculus. After the exam is completed, we will be working on a project related to the ideas that we have been working on during the school year. Note that this project will be happening in May, and will be a significant part of your final marking period grade.

### *What we will be learning this year?*

The content of the course is broken up into seven units. While the table below lists the conceptual topics that we will be covering, it is impossible to list all of the various applications that Calculus has in the real world. We will look at as many applications as we have time for; the goal of this class and the AP exam is for you to be able to understand and apply your knowledge in a variety of familiar and unfamiliar contexts.

<p><b>Unit I: Limits</b></p> <ul style="list-style-type: none"> <li>● Evaluating limits using graphs and tables</li> <li>● Evaluating limits using algebra</li> <li>● Limits involving infinity</li> <li>● One-sided limits</li> <li>● Continuity</li> <li>● The Intermediate Value Theorem</li> </ul>	<p><b>Unit II: Derivatives: Rules and Definitions</b></p> <ul style="list-style-type: none"> <li>● Comparison of Rates of Change</li> <li>● The Tangent Line Problem</li> <li>● The Derivative: Numerically and Graphically</li> <li>● Differentiability vs. Continuity</li> <li>● The Power Rule</li> <li>● Trigonometric Rules</li> <li>● Logarithmic/Exponential Rules</li> <li>● Inverse Trigonometry Rules</li> <li>● The Product Rule</li> <li>● The Quotient Rule</li> <li>● The Chain Rule</li> </ul>	<p><b>Unit III: Derivatives: Applications</b></p> <ul style="list-style-type: none"> <li>● Implicit Differentiation</li> <li>● Global/Local Extrema</li> <li>● The Mean Value Theorem</li> <li>● The First Derivative Test</li> <li>● Higher-Order Derivatives</li> <li>● Concavity</li> <li>● Curve Sketching</li> <li>● Derivatives of Inverse Functions</li> <li>● Linear Approximation</li> <li>● AP Applications: Particle motion</li> <li>● Related Rates</li> <li>● Optimization</li> <li>● L'Hopital's Rule</li> <li>● <i>Euler's Method</i></li> </ul>
<p><b>Unit IV: Integrals: Rules and Definitions</b></p> <ul style="list-style-type: none"> <li>● Reimann Sums</li> <li>● Antiderivative Rules               <ul style="list-style-type: none"> <li>○ Power Rule</li> <li>○ Trigonometric Rules</li> <li>○ Exponential and Logarithmic</li> <li>○ Inverse Trigonometric</li> </ul> </li> <li>● Properties of Integrals</li> <li>● The Fundamental Theorem of Calculus</li> <li>● Average Value of a Function</li> <li>● Integration by Substitution</li> <li>● <i>Integration by parts</i></li> <li>● <i>Integration using partial fractions</i></li> </ul>	<p><b>Unit V: Integrals: Applications</b></p> <ul style="list-style-type: none"> <li>● Area Between Curves</li> <li>● Volume of Solids: Disk and Washer Methods</li> <li>● Differential Equations               <ul style="list-style-type: none"> <li>○ By Separation of Variables</li> <li>○ <i>Logistic Growth</i></li> </ul> </li> <li>● Slope Fields</li> <li>● Distance Traveled on a Line</li> <li>● Integral as Accumulated Change</li> <li>● Use of Initial Conditions with the Fundamental Theorem of Calculus</li> <li>● <i>Improper Integrals</i></li> <li>● <i>Logistic Differential Equations</i></li> </ul>	<p><b>Unit VI: Other functions</b></p> <ul style="list-style-type: none"> <li>● <i>Polar Functions</i> <ul style="list-style-type: none"> <li>○ <i>graphs</i></li> <li>○ <i>derivatives</i></li> <li>○ <i>integrals</i></li> </ul> </li> <li>● <i>Parametric Functions</i> <ul style="list-style-type: none"> <li>○ <i>Graphs</i></li> <li>○ <i>Derivatives</i></li> </ul> </li> <li>● <i>Vector Functions</i> <ul style="list-style-type: none"> <li>○ <i>Graphs</i></li> <li>○ <i>Derivatives</i></li> </ul> </li> </ul> <p><b>Unit VII: Series</b></p> <ul style="list-style-type: none"> <li>● <i>Types of series/common formulas</i></li> <li>● <i>Series tests</i></li> <li>● <i>Maclaurin Series</i></li> <li>● <i>Taylor Series</i></li> <li>● <i>Series error bound</i></li> </ul>

Note: All topics in **red** are topics for BC students only; the rest is common content.

*What tools or skills will I need in order to be successful in this course?*

- 1. Perseverance:** Are you willing to struggle to find a solution? Remember at the end of the year, it is you alone who will be taking the AP exam. Mr. Milazzo's ability to solve Calculus problems will not help you. To be successful in this class, you have to be willing to accept the challenge, and be ready to work until you reach your goal. Remember, especially since most of you are seniors, that the school year does not end in February, or after spring break. It ends at the end of May, and you have to be ready to work until then in order to get the results that you desire out of this course.
- 2. Patience:** Are you going to get things wrong, maybe even multiple times, before you find success? Absolutely- no one in the class (including Mr. Milazzo), is able to avoid making mistakes as we set out to learn Calculus. This is a college level course; you need to give yourself credit for making it this far while at the same time reminding yourself that success can easily be found from failure. Not trying is the easiest way to not be successful in this class. Getting things wrong is part of quality growth.
- 3. Bring the tools of a good mathematician:** Pencils or pens, paper to take notes and complete homework assignments, your textbook, and a graphing calculator are the things that you will need. We will have a set of TI-84s available to loan out if you don't have one; but having your own to learn from is even more useful.
- 4. More on graphing calculators:** By the time students reach this Calculus course, it is expected that they have a basic knowledge of abilities of the graphing calculator. Any AP Calculus course is designed with the intention that the students will have the ability to use and understand Calculus with and without the calculator; the AP exam is designed with the same goal in mind. While the calculator can be used for many things related to this course, there are four standard uses that we will focus on:
  - Graphing of a function within a specific domain and range
  - Find zeros or intercepts of a function or functions
  - Calculating a derivative at a point
  - Calculating a definite Integral
- 5. Time:** This refers to being able to complete work outside of the class period, as well as good time management skills. You will have work on homework outside of the school day, as well as group assignments and other relevant online activities. Additionally, if you are taking multiple AP courses, they all have to stay a part of your daily schedule! Falling behind on one course can easily lead you to falling behind in all of them.
- 6. Willingness to get help:** You have two chances each week to come to office hours, Tuesdays and Thursdays from 1:10 to 1:40. Use them! This will be the place you can ask questions about some of the assignments we don't get to talking about during the regular class period. Additionally, if your questions come up outside of that time, email me a picture of what you are doing; I will answer emails up to 7:00 pm each evening; otherwise I will get to you during the next day.

*How will this course be graded?*

For each marking period:

Assessments- 85%- this will include various topic quizzes throughout each unit (will be announced on the calendar) as well as tests at the end of each unit.

Group work- 5%- each unit will consist of at least one group work assignment, with one assignment being turned in per group. All group members will be graded on the same assignment. These assignments will consist of AP style problems, as well as other relevant review

Other assignments- 10%- these will be all of the things we do in class, as well as anything else I assign you through Canvas. This also includes assignments that are on the AP Classroom site.