



Tohoku International School

Secondary School Course Syllabus

Course Title: AP Calculus BC	Teacher: Mr. Stephen Messano Email: smessano@tisweb.net
Grade Level: Grade 12	Time Frame: 37 weeks
<p>Course Description: This course will cover the four major concepts to be mastered in first-year calculus: limit, derivative, definite integral, and indefinite integral. For each concept, the student should be able to know the precise definition, have an intuitive understanding of what the concept means, be able to “do” the concept, and be able to apply it in the real world or mathematical world.</p> <p>There are four ways this knowledge can be obtained – numerically, graphically, algebraically, and verbally. Students are expected to achieve expertise in using all of these ways to enhance their understanding. Furthermore, students are expected to be able to use any of these ways to communicate their understanding to others.</p> <p>Students in this course are strongly encouraged to take the College Board’s AP Calculus BC exam in May 2019.</p>	
<p>Course Philosophy:</p> <p>Have you ever seen an eagle soar through the sky? Have you ever wondered how high an elm tree can grow? When you see changes happening in the dynamic world around you – the ripples of the water on a pond, the curve of an eggshell before a newborn chick starts a new life, the trail of a star as it falls from the heavens – did you ever dream that it is possible to measure and – more importantly – <i>predict</i> how and when such changes can occur? Calculus is one of the greatest achievements of humankind, on a par with the pyramids of Egypt or Colossus of ancient Rhodes. With it, we have a window with which we can see a greater part of our universe.</p>	
<p>Course Objectives:</p> <p>By the end of this course, the student will be able to:</p> <ul style="list-style-type: none"> • Learn how to find limits of functions analytically, graphically, and numerically. • Use limits to find slopes of tangent lines to graphs (differentiation). • Use calculus to analyze graphs of functions, determining maximum and minimum values, asymptotes, and other salient features. • Learn how the limit process can be used to find areas of a wide variety of regions (integration). • Apply the concepts of differentiation and integration to logarithmic, exponential, and other transcendental functions to model real-life situations. • Use slope fields to show the general shape of all solutions of a differential equation. • Use limits to write the exact volume of a solid of revolution as a definite integral. • Understand a variety of integration techniques (including L’Hôpital’s Rule) to determine whether improper integrals converge or diverge. • Use infinite series (including Taylor Series, Maclaurin Series, and Power Series) to approximate various types of functions. • Use the limit process and sectors of circles to find the area of regions defined by polar and parametric equations. • Apply the concepts of differentiation and integration to vectors and vector-valued functions to solve problems involving velocity and acceleration. 	
<p>Units of Study:</p> <ul style="list-style-type: none"> • Limits and Their Properties • Differentiation • Applications of Differentiation 	

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AP Calculus BC (cont'd)

- Integration
- Logarithmic, Exponential, and Other Transcendental Functions
- Differential Equations
- Applications of Integration
- Integration Techniques, L'Hôpital's Rule, and Improper Integrals
- Infinite Series
- Conics, Parametric Equations, and Polar Coordinates
- Vectors and Vector-Valued Functions
- Velocity and Acceleration

Assessments:

Projects (20%)

- Each student will be expected to complete a special project each semester.
- There are various types of formats for these projects: research papers, posters, video projects, in-class presentations, math skits, etc.
- Some projects will be done individually; others will be in pairs or small groups.
- Detailed information will be provided at the time the project is assigned.

Final Exam (15%)

- A final exam will be given at the end of the year to assess each student's overall understanding of the concepts covered in this course.

Quizzes (20%) and Tests (40%)

- Students should expect several quizzes per unit of study.
- Quizzes will always be announced in advance.
- Students may use their graphing calculator and math notebook on most quizzes.
- When a quiz is returned to a student, s/he has the option of revising any mistakes on that quiz, re-submitting it, and receiving up to half the points missed.
- At the end of each chapter or unit of study, there will be a test to assess each student's understanding.
- Tests will always be announced in advance.
- Students may use their graphing calculator and math notebook on most tests.
- When a test is returned to a student, s/he has the option of revising any mistakes on that test, re-submitting it, and receiving up to half the points missed.

Learning Skills (10%)

- Attendance, organization, homework completion and the ability to take initiative and work independently and in groups all play a role in student success and are important for achieving course expectations.

Course Specific Materials Required

- Graphing calculator (TI-84 Plus or TI-84 Plus Silver Edition)
- Textbook: *Calculus of a Single Variable, 8th Edition*, by Larson, Hostetler, and Edwards
- Folder for saving quizzes, tests, and other papers

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