Instructor: Maria Branco **2020-2021**
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Course Title: AP Calculus AB

Prerequisites:

Prerequisites for the student include two years of algebra and a year of geometry, plus a strong grounding in elementary functions and their graphs, including trigonometry in pre-calculus. Attitude prerequisites include a willingness to work both in and out of class, a willingness to collaborate with classmates to foster mutual understanding, and a sincere intent to place out of the first semester of college calculus rather than repeat it.

Course Description:

Calculus AB is to enable students to appreciate the beauty of calculus and receive a strong foundation that will give them the tools to succeed in future mathematics courses. The course emphasizes a "Rule of Four." The four branches of the problem-solving tree of mathematics are:

- Numerical analysis
- Graphical analysis
- Analytic/algebraic analysis
- Verbal/written methods of representing problems

Goals:

By successfully completing this course, you will be able to:

- Work with functions represented in a variety of ways and understand the connections among these representations.
- Understand the meaning of the derivative in terms of a rate of change and locate linear approximation, and use derivatives to solve a variety of problems.
- Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Communicate mathematics both orally and in well-written sentences to explain solutions to problems.
- Model a written description of a physical situation with a function, a differential equation, or an integral.
- Determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- Develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.
- Use technology to help solve problems, experiment, interpret results, and verify conclusions.

Required Text:

Calculus of a Single Variable, 9th Ed. 2010, Larson, Edwards., Cengage Learning (online textbook)
Webassign.com **Your Class Key: northprovidence.ri 5629 2473**
There is 1 homework and 9 Quizzes

Online Required Accounts:

Deltamath.com

Instructions to access summer assignment:

1. Log onto deltamath.com

2. Click in the upper right hand corner on "Create Account" for Student
3. Use teacher code 254016
4. Add your class from the drop down menu - AP Calculus AB
5. Create account with your name and email
6. Once the account is created, you will see assignments that need to be completed.
7. There are **THREE QUIZZES which will double count**

Google Classroom

Code: W5SHW72

AP Classroom

Code: PR9RA6

Supplies:

- notebook or filler paper
- binder to hold 3 hole punch notes
- graphing calculator (required), please see me if you need a calculator

Technology Requirement:

A Texas Instrument (TI-84 Plus CE) is required of all students. The calculator will facilitate conducting explorations, graphing functions, solving equations numerically, analyzing and interpreting results, and justifying and explaining results of graphs and equations. **Use of the calculator by students to solve problems includes, but is not limited to, plotting and analyzing the graphs of functions within an arbitrary viewing window, finding the zeros of functions, finding the limit of a function at a specific value, and analytically and numerically calculating both the derivative of a function and the value of a definite integral.** The calculator will **not** be allowed on ALL assessments.

Grading Policy:

- Summative (Tests, Projects) 40%
- Interim Assessments (Quizzes) 35%
- Course Assignments (POWs, AP Problem Sets, Group Problems, Online Assignments) 15%
- Homework 10%
- Questions on assessments may be taken from old AP exams and materials. The AP level questions are designed to be challenging for a knowledgeable student. There will be a combination of calculator and non-calculator questions that are in multiple choice and free response format. Multiple choice questions are either correct or incorrect, no partial credit will be given. The time limit for assessments will be strictly adhered to.
- Exams will be part of semester averages; **all students are required to take a mid-term and final exam**

Sample **AP Problem sets** will be assigned and practiced throughout the coverage of the course content. These sample AP problems will be in both multiple choice and free-response formats.

The **AP Problem sets** provide students with the opportunity to:

- Review the course material for the exam.
- Discover weaknesses in understanding concepts or in communicating the understanding of topics.
- Practice proper notation expected when taking the exam.

The AP Calculus Exam:

Visit http://apcentral.collegeboard.com to learn about the calculator usage policy and showing work in free-response sections, as well as to practice sample problems.

Section I. **Multiple Choice** 45 problems, 105 min.	Part A	28 problems, 55 min. No calculator allowed. (about 2 min/problem)
	Part B	17 problems, 50 min. Some problems will require a calculator. (about 3 min/problem)
Section II. **Free-Response** 6 problems, 90 min.	Part A	2 problems, 30 min. Some problems will require a calculator. (15 min/problem)
	Part B	4 problems, 60 min. * No calculator allowed. (15 min/problem)

* If you have extra time when you finish Section II. Part B, you are permitted to return to Section II. Part A and continue working on that section only without a calculator.

Note: Sections I. and II. are weighted equally.

Homework & Makeup Policy:

- Homework will be assigned on a regular basis. All homework assignments are due the following class meeting unless otherwise stated (NO EXCEPTIONS!). Homework is checked at the beginning of the class and will not be accepted during, end, or after class unless it was an absence.
- When students are absent, it is the responsibility of the student to get all missed material and assignments. Do not interrupt the class for missed work.
- If you are absent the day before an assessment and know about the assessment and return the following day, you are still responsible for taking the assessment at that time (NO EXCEPTIONS!)
- Due to the fast pace and depth of the material in the course, it is expected that you are in class every day unless you are seriously ill.

Course Outline

Prerequisites

Successful completion of the following yearlong courses:

1. Algebra 1
2. Geometry

3. Algebra 2 (which includes analytic geometry and logarithms)
4. Precalculus (which includes elementary functions and trigonometry)

Curricular Requirements

Chapter P-Preparation for Calculus *summer assignment*
- Graphs and Models
- Linear models and rates of change
- Functions and their graphs
- Fitting models to data

Big Idea 1: Limits

Chapter 1-
- Limits and Their Properties *summer assignment*
- A preview of Calculus
- Finding Limits Graphically and Numerically with technology
- Evaluating Limits Analytically
- One-Sided Limits
- Two Side Limits
- Infinite Limits
- Limits that Fail to exist
- Squeeze Theorem
- Continuity
- Discontinuous Functions: Removable, Jump, and Infinite
- Properties of continuous functions
- Intermediate Value Theorem
- Extreme Value Theorem

Big Idea 2: Derivatives

Chapter 2-Differentiation
- The Derivative and the Tangent Line Problem
- Basic Differentiation Rules and Rates of Change
- Product and Quotient Rules and Higher-Order Derivative
- The Chain Rule
- Implicit Differentiation
- Related Rates
- The Natural Logarithmic Function: Differentiation
- Inverse Functions
- Exponential Functions: Differentiation
- Inverse Trigonometric Functions: Differentiation
- Bases Other than e and Applications

Chapter 3-Applications of Differentiation
- Extrema on an Interval
- Rolle's Theorem and the Mean Value Theorem
- Increasing and Decreasing Functions and the First Derivative Test
- Concavity and the Second Derivative Test
- Limits at Infinity
- L'Hospital's Rule
- A summary of Curve Sketching

Optimization Problems
Newton's Method
Differentials

Big Idea 3: Integrals and the Fundamental Theorem of Calculus

Chapter 4-Integration
- Anti derivatives and Indefinite Integration
- Area
- Riemann Sums and Definite Integrals
- **The First Fundamental Theorem of Calculus**
- **The Second Fundamental Theorem of Calculus**
- Integration by Substitution
- Numerical Integration

Chapter 5-Logarithmic, Exponential, and Other Transcendental Functions
- The Natural Logarithmic Function: Integration
- Inverse Functions
- Exponential Functions: Integration
- Bases Other than e and Applications
- Inverse Trigonometric Functions: Integration

Chapter 6-Differential Equations
- Slope Fields
- Differential Equations: Growth and Decay
- Separation of Variables and the Logistic Equation

Chapter 7-Applications of Integration
- Area of a Region Between Two Curves
- Volumes of solids with known cross sections
- Volumes of solids of revolution: Disk/Washer and Shell Methods

Chapter 8-Integration Techniques
- Basic Integration Rules

Mathematical Practices

The following is a brief description of some of the activities included in the course.

1. Reasoning with definitions and theorems
    - LO 1.2B-In problems where students practice applying the results of key theorems (e.g., Intermediate Value Theorem, Mean Value Theorems, and/or L'Hospital's Rule), students are required for each problem to demonstrate verbally and/or in writing that the hypotheses of the theorems are met in order to justify the use of the appropriate theorem. For example, in an in-class activity, students are given a worksheet that contains a set of functions on specified domains on which they must determine whether they can apply the Mean Value Theorem. There are cases where some of the problems do not meet the hypotheses in one or more ways. Students are also asked to watch a video on Mean Value Theorem and justify whether the function can apply or not the Mean Value Theorem. [CR2a]

2. Connecting concepts and processes

- LO 3.3A-Students are provided with the graph of a function and a second function defined as the definite integral of the graphed functions with a variable upper limit. Using differentiation and antidifferentiation, students evaluate specific values of the second function and then find the intervals where the integral function is increasing, decreasing, concave up, and concave down. They use this information to sketch a rough graph of the second function. [CR2b] [CR2: graphical]

3. Implementing algebraic/computational processes
    - LO 3.2B- Students are provided with multiple opportunities to implement algebraic and compute for basic differentiation as well as with the following: Differentiation rules for sums, differences, products, quotients, and higher order derivatives. [CR2c]
    - LO 3.2B- Additionally, students are presented with a table of observations collected over time periods of different lengths (e.g., temperatures or stock prices). Students use Riemann sums to numerically approximate the average value of the readings over the given time period and interpret the meaning of that value. [CR2c][CR2d: numerical]
4. Connecting multiple representations
    - LO 2.3C- Students are presented with numerous functions modeling velocity and time for objects in motion. These functions are presented numerically, graphically, analytically (in the form of a formula), and verbally (as a description in words of how the function behaves). many of these function are distinct, but some represent the same function (e.g., one of the functions presented verbally is the same as one of the functions presented analytically). Given some initial conditions, students calculate or approximate displacement, total distance travelled , and acceleration for these functions (both by hand and with a graphing calculator), and determine which representations are the same function. Students evaluate how each representation was useful for solving the problems. [CR2d: connection between analytical and verbal] [CR3b][CR2d][CR3b]
5. Building notational fluency
    - LO 3.5B- Students are given a variety of growth and decay word problems where the rate of change of the dependent variable is proportional to the same variable (e.g., population growth, radioactive decay, continuously compounded interest, and/or Newton's law of cooling). Students are asked to translate the problem situation into a differential equation using proper notation. Students show the steps in solving the differential equation, continuing to use proper notation for each step (e.g., when to keep or remove absolute value). In a later activity, students will vary initial conditions and use their calculators to graph the resulting solutions so that students can explore the effect of these changes. [CR2e][CR3c]
6. Communicating
    - Throughout the course, students are required to present solutions to homework problems, HOT questions, and group presentations orally and on the board to the entire class as well as in written response. On at least one question on each quiz and test, students are explicitly instructed to include clearly written justifications in complete sentences for their solutions. [CR2f]

AP Calculus AB Summer Assignments 2020

Getting Started with WebAssign	online tutorial on WebAssign.com	due 6/15/20 on webassign
Chapter P Section1 Graphs and Models	Read **Additional if needed** Page 8 1-10all, 13, 19,21,29,63,65	webassign has due date
Chapter P Section 2 Linear Models and Rates of Change	Read **Additional if needed**, Page 16 1-7all, 14,19,21b,22b,23-28,29,45,46	webassign has due date
Chapter P Section 3 Functions and Their Graphs	Read **Additional if needed** Page 27 1-3,8,13-16,22,27,28, 30-35,39,41,44,45,46,49-54,61-66,75, 97ab	webassign has due date
Chapter P Section 4 Fitting Models to Data	Read	webassign has due date
Chapter 1 Section 1 A Preview of Calculus	Read **Additional if needed**, Page 47 1-6all, 8(1st graph), 10 and Complete Worksheet 1.1 in note packet	webassign has due date
Chapter 1 Section 2 Finding Limits Graphically and Numerically	Read **Additional if needed**, Page 55 1-19odd, 25,27,29 video: http://online.math.uh.edu/HoustonACT/videocalculus/SV3/01-limits1.mov	webassign has due date
Chapter 1 Section 3 Evaluating Limits Analytically	Read **Additional if needed**, Page 67 1-37odd Page 68 45-69odd video: http://online.math.uh.edu/HoustonACT/videocalculus/SV3/02-limits2.mov	webassign has due date

Chapter 1 Section 4 Continuity and One-Sided Limits	Read **Additional if needed**, Page 78 1-19odd, skip13,27,31,37,39,69,71 video: http://online.math.uh.edu/HoustonACT/videocalculus/SV3/04-continuity.mov	webassign has due date
Chapter 1 Section 5 Infinite Limits	Read **Additional if needed**, Page 88 1-25odd (skip 3), 33,35	webassign has due date
Chapter 1 Review	Page 91 1,2,5,11-17odd,33,34,37,38,41,44,59	**due 9/4/20 (first day of class)-submit work in class**
Chapter 1 Test		**2nd day of class 9/8/20**

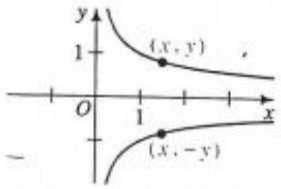
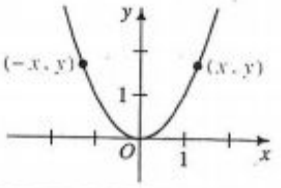
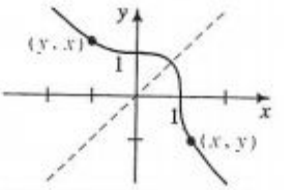
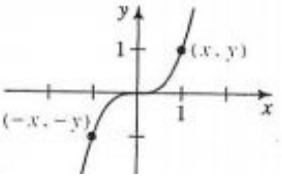
RESOURCES:

- http://online.math.uh.edu/HoustonACT/videocalculus/index.html
- http://www.showme.com/pscriffiny
- http://www.showme.com/mbrocke
- REALLY GOOD VIDEOS that align with our textbook, http://calculus.flippedmath.com/unit-1---limits.html

*there are many excellent videos on "showme" from these two people: Patti Scriffiny and Michael Brocke on all Calculus topics. Feel free to browse for each section listed on the syllabus

- Keep a notebook with your notes as you read each section.
- Pace yourself accordingly. Practice the skills and concepts required or you will be at a disadvantage at the beginning of the year.
- This class requires a good amount outside of the class in order to do well and also even more time to do well on the AP exam. You will need to dedicate an extra amount of outside studying in order to do well such as practicing AP practice sets.
- Complete and sign the classroom expectation sheet attached with **the school email** that you will use frequently for teacher notes and notifications through Google Drive. It is the student's responsibility to manage their school email through the summer and throughout the year.
- If you lose this syllabus, there is a copy on the school department website. Good Luck and have a great summer!

Special Tests for the Symmetry of a Graph

Type of Symmetry	Example
Symmetry in the x-axis *Meaning*: $(x, -y)$ is on the graph whenever (x, y) is. *Testing an equation of a graph*: In the equation, leave x alone and substitute $-y$ for y. Does an equivalent equation result?	$y^2x = 1$ $(-y)^2x = 1$ equivalent 
Symmetry in the y-axis *Meaning*: $(-x, y)$ is on the graph whenever (x, y) is. *Testing an equation of a graph*: In the equation, substitute $-x$ for x and leave y alone. Does an equivalent equation result?	$y = x^2$ $y = (-x)^2$ equivalent 
Symmetry in the line $y = x$ *Meaning*: (y, x) is on the graph whenever (x, y) is. *Testing an equation of a graph*: In the equation, interchange x and y. Does an equivalent equation result?	$x^3 + y^3 = 1$ $y^3 + x^3 = 1$ equivalent 
Symmetry in the origin *Meaning*: $(-x, -y)$ is on the graph whenever (x, y) is. *Testing an equation of a graph*: In the equation, substitute $-x$ for x and $-y$ for y. Does an equivalent equation result?	$y = x^3$ $-y = (-x)^3$ equivalent 

Advanced Placement Calculus AB STUDENT CONTRACT

Please fill out the following information accurately and clearly

Carefully read each of the following contract terms. INITIAL each item in the space provided. When finished, *both YOU and your PARENT must sign and date the contract*.

_____ I have read the ENTIRE course syllabus and understand that every part of the syllabus pertains to me; I know that I will be held directly and immediately accountable for my actions should I choose to violate or ignore any of those provisions.
_____ I understand that this is a college course with college-level expectations, and I understand that my work will be held to a college-level standard. I understand the class will be rigorous and move quickly through the required curriculum as prescribed by the College Board. I will be taking AP style assessments to help prepare me for the AP exam even if I choose not to take the exam.
_____ I understand that the teacher is available to help me during Coaching.
_____ One objective of this course is to prepare me for the AP Calculus AB test.
_____ I will read the text as assigned, I will take notes on the chapters, and I will bring the book to class when asked to do so by the teacher.
_____ I will not cut/or intentionally be absent from this class to avoid taking tests.
_____ I will make up or turn in missed tests/work by email &/or the next day even if I don't have this class, and I understand the penalties for work marked late.
_____ I will complete the Summer Assignment by the assigned deadlines. Webassign has a penalty for late assignments.
_____ I will behave appropriately in class, treating the teacher and my fellow students with respect. I understand that failure to do so will result in disciplinary action per the NPHS Student Handbook.
_____ **I understand the standards for academic and participation grades, especially those that pertain to academic dishonesty/plagiarism and absences; I understand the consequences for academic dishonesty/plagiarism, and for failure to make up work or tests due to absences.**
_____**I have technology and wifi to be able to complete my assignments, enabling camera and audio for assessments.**
_____ I understand that by signing off on this contract, I ***cannot*** drop this course after the **last day of school on June 15, 2020.**

By signing this contract, you verify that you have read and understand the student contract, course syllabus, and summer assignments and deadlines:

STUDENT:
Printed Name: _____Signature _____

Date: _____

PARENT:
Printed Name: _____Signature _____

Date: _____