



**AP Calculus AB Syllabus
CHS Mathematics Department**

Contact Information: Parents may contact me by phone, email, or visiting the school.

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- Google Classroom

CCSD Vision Statement: The Chillicothe City School District will provide tomorrow's leaders with a high quality education by developing high expectations and positive personal relationships among students, staff, and community members.

CCSD Mission Statement: The Chillicothe City School District empowers students to learn, to lead, and to serve.

Course Description and Prerequisite(s) from Course Handbook:

Advanced Placement Calculus AB - 264

State Course #: 119930

Prerequisite: Students must have attained a "B+" or better in Advanced Mathematics and College Trigonometry or Trigonometry and gain teacher approval

Elective

Grade: 12

Weighted Grade

Credit: 1

Course Description:

The Calculus AB course is primarily concerned with developing the students' understanding of the concepts of calculus and providing experience with its methods and applications. The major AP calculus AB topics are: 1) derivatives & their applications to curve analysis and to optimization; 2) the major theorems; 3) integrals & Riemann's to accumulate area; and 4) using the graphing calculator as a tool to help verify/support graphs, solutions and conjectures. The course continues to emphasize a multirepresentational approach to calculus.

Students are expected to take and pay for the AP exam. If the student fails to take the exam, a 4.5 point grading scale will be applied to the course.

The course is designed to prepare students to perform well on the examination. A student who earns a 3 or above on the exam will be granted college credit at most colleges and universities throughout the United States

Learning Targets: Defined below for clarity are the Unit Titles, Big Ideas of every Unit taught during this course, and the Essential Questions to be answered to better understand the Big Ideas. A student's ability to grasp and answer the Essential Questions will define whether or not he or she adequately learns and can apply the skills found in Big Ideas. This will ultimately define whether or not a student scores well on assessments administered for this course.

- **1st Quarter**
 - **Unit I Title: Limits and Continuity**
 - **Big Idea #1: I can use the concept of a limit to understand the behavior of functions.**
 - *Essential Question #1: How are limits expressed symbolically using correct notation?*
 - *Essential Question #2: How are limits expressed symbolically interpreted?*
 - *Essential Question #3: How are limits of functions estimated?*
 - *Essential Question #4: How are limits of functions determined?*
 - *Essential Question #5: How is the behavior of functions using limits deduced and interpreted?*
 - **Big Idea #2: I can understand continuity is a key property of functions that is defined using limits and apply this knowledge to analyze functions and prove theorems.**
 - *Essential Question #1: How are functions analyzed for intervals of continuity or points of discontinuity?*
 - *Essential Question #2: How is the applicability of important calculus theorems using continuity determined?*
 - **Unit II Title: Derivatives**
 - **Big Idea #1: I can understand the derivative of a function is defined as the limit of a difference quotient and determine derivatives using a variety of strategies.**
 - *Essential Question #1: How is the derivative of a function as the limit of the difference quotient identified?*
 - *Essential Question #2: How are derivatives estimated?*
 - *Essential Question #3: How are derivatives calculated?*

- *Essential Question #4: How are higher order derivatives determined?*
- **2nd Quarter**
 - **Unit III Title: More Derivatives**
 - **Big Idea #1: I can understand the derivative of a function is defined as the limit of a difference quotient and determine derivatives using a variety of strategies.**
 - *Essential Question #1: How is the derivative of a function as the limit of the difference quotient identified?*
 - *Essential Question #2: How are derivatives estimated?*
 - *Essential Question #3: How are derivatives calculated?*
 - *Essential Question #4: How are higher order derivatives determined?*
 - **Unit IV Title: Applications of Derivatives**
 - **Big Idea #1: I can use the Mean Value Theorem to connect the behavior of a differentiable function over an interval to the behavior of the derivative of that function at a particular point in the interval.**
 - *Essential Question #1: How is the Mean Value Theorem applied to describe the behavior of a function over an interval?*
 - **Big Idea #2: I can use and analyze a function's derivative, which is itself a function, to understand the behavior of the function.**
 - *Essential Question #1: How are derivatives used to analyze properties of a function?*
 - *Essential Question #2: How is the connection between differentiability and continuity recognized?*
 - **Big Idea #3: I can understand the derivative has multiple interpretations and applications including those that involve instantaneous rates of change and can solve and interpret these problems.**
 - *Essential Question #1: How is the meaning of a derivative within a problem interpreted?*
 - *Essential Question #2: How are problems involving the slope of a tangent line solved?*
 - *Essential Question #3: How are problems involving optimization and rectilinear motion solved?*
- **MID-TERM EXAM**
- **3rd Quarter**

- Unit V Title: Integration Rules and Techniques
 - Big Idea #1: I can recognize and understand antidifferentiation is the inverse process of differentiation.
 - *Essential Question #1: How are antiderivatives of basic functions recognized?*
 - Big Idea #2: I can understand and interpret the definite integral of a function over an interval is the limit of a Riemann sum over that interval and can calculate it using a variety of strategies.
 - *Essential Question #1: How is the definite integral as the limit of a Riemann sum interpreted?*
 - *Essential Question #2: How is the limit of a Riemann sum expressed in integral notation?*
 - *Essential Question #3: How is a definite integral approximated?*
 - *Essential Question #4: How is a definite integral calculated using areas and properties of definite integrals?*
 - Big Idea #3: I can understand the Fundamental Theorem of Calculus, which has two distinct formulations, connects differentiation and integration and use it to calculate and evaluate problems.
 - *Essential Question #1: How are functions defined by an integral analyzed?*
 - *Essential Question #2: How are antiderivatives calculated?*
 - *Essential Question #3: How are definite integrals evaluated?*
- Unit VI Title: Differential Equations
 - Big Idea #1: I can understand antidifferentiation is an underlying concept involved in solving separable differential equations. Understanding solving separable differential equations involves determining a function or relation given its rate of change. Then, apply this knowledge to find and analyze solutions.
 - *Essential Question #1: How are differential equations analyzed to obtain general and specific solutions?*
 - *Essential Question #2: How are differential equations from problems in context interpreted, created and solved?*
- 4th Quarter
 - Unit VII Title: Application of Integration
 - Big Idea #1: I can understand and apply the definite integral of a function over an interval is a mathematical tool with

many interpretations and applications involving accumulations.

- *Essential Question #1: How is the meaning of a definite integral within a problem interpreted?*
- *Essential Question #2: How are definite integrals applied to problems involving the average value of a function?*
- *Essential Question #3: How are definite integrals applied to problems involving motion?*
- *Essential Question #4: How are definite integrals applied to problems involving area and volume?*
- *Essential Question #5: How is the definite integral used to solve problems in various contexts?*
- **AP Calculus AB Exam Tuesday, May 14, 2019**
 - **Unit VIII Title: Introduction to Calculus BC**
 - **Big Idea #1: I can apply antidifferentiation by parts.**
 - *Essential Question #1: How are the following techniques for finding antiderivatives applied? algebraic manipulation such as long division and completing the square, substitution of variables integration by parts and nonrepeating linear partial fractions.*
 - **Big Idea #2: I can understand and interpret improper integrals.**
 - *Essential Question #1: How is an improper integral evaluated?*
 - *Essential Question #2: When does an improper integral diverge?*
 - **Big Idea #3: I can calculate and define lengths of curves and volume.**
 - *Essential Question #1: How is the definite integral used to determine displacement, distance, and position of a particle moving along a curve given by parametric or vector-valued functions?*
 - *Essential Question #2: How are areas bounded by polar curves calculated with definite integrals?*
 - *Essential Question #3: How are the length of a planar curve defined by a function or by a parametrically defined curve calculated using a definite integral?*

Course Materials:

Google Chromebook

3" 3-ring Binder with Dividers

Loose Leaf College Ruled Paper

Pencils

Graph Paper

Colored Pencils

Graphing Calculator (TI-84+ is recommended)

The graphing calculator is used to help students develop an intuitive feel for concepts before they are approached through typical algebraic techniques. We use the calculator as a tool to illustrate ideas and make discoveries about functions in Calculus. The four required functionalities of graphing technology are:

1. Finding a root
2. Sketching a function in a specified window
3. Approximating the derivative at a point using numerical methods
4. Approximating the value of a definite integral using numerical methods

Students are also required to make connections between the graphs of functions and their analysis, and conclusions about the behavior of functions when using a graphing calculator

Many of the discovery lessons rely heavily on the use of the graphing calculator. The calculator helps students develop a visual understanding of the material that they would not otherwise have. My students use the TI-84 graphing calculator almost every day in class for explorations (such as experimenting to discover the power rule for derivatives or exploring the graphs of f and its derivative to discover relationships between them) and in assignments to analyze functions and justify solutions. For example, the students use the calculator to approximate the values of derivatives and definite integrals obtained through analytical means in order to verify that the answers are reasonable. [SC11, SC12 & SC13]

However, many homework problems and about half of the problems on quizzes and tests are done without the use of the graphing calculator. Because the AP Exam is half calculator and half non-calculator, I feel that it is very important for students to have practice working problems both ways. We spend time in class talking about the types of questions that they must know how to solve with their calculators and the types of questions that they must know how to solve without their calculators. We also discuss the techniques needed to use the calculator most efficiently (storing functions in the $y =$ screen, storing values that will be used later in the problem, etc.).

Textbook:

- Finney, Demana, Waits, and Kennedy (2012). *Calculus Graphical, Numerical, Algebraic*. 4th ed. Pearson

Electronic Resources:

- Google Classroom

- Albert.io <https://www.albert.io/classes>
- GeoGebra <https://www.geogebra.org/>
- National Library of Virtual Manipulatives <http://nlvm.usu.edu/>
- NCTM Illuminations <http://illuminations.nctm.org/>
- Purplemath <http://www.purplemath.com/modules/index.htm>
- College Board <https://apstudent.collegeboard.org/apcourse/ap-calculus-ab>
- <http://online.math.uh.edu/apcalculus/>
- <http://www.calculus.org/>
- <https://sites.google.com/a/jeffcoschools.us/aw-ap-calculus-ab/useful-websites>

Course Expectations:

Rule of Four

I give my students many opportunities to work problems presented in a variety of ways: graphical, numerical, analytical, and verbal. Most of the problems in my primary textbook are written with an analytical representation, so I frequently supplement these problems with ones that utilize a graph or tabular data. I also often ask students to work in groups or to come to the board for oral explanations to give them the opportunity to communicate their reasoning in spoken words. [SC9]

Justification of Answers

I ask my students to justify their answers on homework, quizzes, and tests, and I require that they write the justifications in sentences. We talk a lot about the amount of work they need to show and the correct way to justify their work on various types of problems. [SC10] (The “Commentary on the Instructions for the Free-Response Section 5 of the AP® Calculus Exams” on AP Central is very helpful in showing examples of correct justifications.)

C2-The course teaches all topics associated with Functions, Graphs, and Limits; Derivatives; and Integrals as delineated in the Calculus AB Topic Outline in the AP Calculus Course Description.

C3-The course provides students with the opportunity to work with functions represented in a variety of ways—graphically, numerically, analytically, and verbally—and emphasizes the connections among these representations.

C4-The course teaches students how to communicate mathematics and explain solutions to problems both verbally and in written sentences.

C5-The course teaches students how to use graphing calculators to help solve problems, experiment, interpret results, and support conclusions

The Mathematical Practices for AP Calculus will be a major focus of this course. They include:

MPAC 1: Reasoning with definitions and theorems

MPAC 2: Connecting concepts

MPAC 3: Implementing algebraic/computational processes

MPAC 4: Connecting multiple representations

MPAC 5: Building notational fluency

MPAC 6: Communicating

Rules:

1. Be **RESPECTFUL** at all times.
2. Employ the **4P's** every day.
 - a. Be **PROMPT!**
 - b. Be **PREPARED!**
 - c. Be **POSITIVE!**
 - d. **PARTICIPATE!**
3. Work from **BELL TO BELL.**
4. 3 Before Me!
5. Be **HONEST!**
6. **NEVER GIVE UP**

Procedures: Entering the class room:

1. Enter **quietly** and sit down in your assigned seat.
2. Look at the board to see what materials you will need out on your desk.
3. Start on your Bell Ringer (**BR**) up on the SMART Board.
4. You may quietly talk to the person next you **UNTIL THE TARDY BELL RINGS!**
5. Once finished with your **BR** wait quietly in your seat for us to go over it together.

Heading your papers:

- Top Right of the paper Put the assignment, your First and Last Name, and the Date assigned.
- Ex. If assigned Pg. 345 # 4-30 Even

Turning in Homework and Assignments:

1. Look to make sure you headed the paper correctly.
2. More than one page:
 - a. Students need to make sure their name is on all pages.
 - b. Students are to quietly get up and go to the teacher's desk.
 - c. They are to staple all the pages together in the correct order.
 - d. Then they are to hand the paper to the student sitting in the front row closest to the teacher's desk.

Taking Notes:

Students are to have their notebook, a pencil, and a Chromebook with them every day. Students are to responsible for keep their notebooks organized and up to date. Notebook quizzes over the notes taken will be given after every unit or at least every 9 weeks.

Pencil Sharpening:

- Students can quietly get up one at a time to sharpen their pencil at anytime, unless if testing, and sit back down without bugging or talking to anyone else. **If testing the student needs to ask for permission first.**
- If the teacher or anyone else is up talking:
 - o Student needs to walk to the back of the classroom and around by the computers up to the electric sharpener by on the white shelf, and take the same trip back. This way you are not distracting others by crossing in front of the board or the person talking.

Getting a Tissue:

- Students can quietly get up one at a time to grab a tissue at anytime, unless if testing, and sit back down without bugging or talking to anyone else. **If testing the student needs to ask for permission first.**
- The same procedure for pencil sharpening is in place for tissues. Please walk along the back of the classroom.
- There is a trash can beside my desk so students do not need to walk all the way across the room to throw their tissues away.
- **USE HAND SANITIZER AFTER BLOWING YOUR NOSE!** We don't want your germs, and I will call you out in class and make you go back and use it.

Cavalier Café:

Students are to order from the café the first 3 minutes of class. When the order is delivered, students are to walk quietly to the back of the classroom and around by the cabinets to the door and take the same trip back. This way you are not distracting others by crossing in front of the board or the person talking. Ordering from the café is a privilege that can be taken away at any time. Students must clean up after themselves.

Tests and Quizzes:

1. Students will have until the bell rings to quickly review.
2. Once the tardy bell rings, students will need to clear their desks of everything but their Chromebook (if applicable), paper, and a pencil. All other things need to be placed at the front of the room and this includes cell phones! NO CELL PHONES are permitted on your person while testing. If you do not have a bag to place it in you may put it in the technology box provided on by desk.

3. **There is to be no talking at all!** Unless the teacher has given permission to do so, for instance if you have raised your hand to ask a question. All other talking will be considered cheating and will result in the test being taken and the student given an F.
4. Once finished with the test they are to work on the given assignment.
5. **No electronic devices except for the calculator and Chromebook will be permitted during a test!** If seen it will be considered cheating and the test or quiz will be taken from the student and they will be given an F.
6. **Making up a test or quiz is the student's responsibility! If they are absent on the day of a test or quiz the student is to come to Mrs. Nicely either at the very beginning or very end of class to setup a time to take it. I will not chase down students to take tests! If they forget to make it up they will receive an F for the Test or Quiz!**

Electronic Devices:

1. Students will be required to put their cell phones in the provided container. All other electronic devices, iPods, mp3 players, and etc., are to be placed in their bag.
2. Students will only be allowed to use them when instructed for class use.
3. Students will not be permitted to listen to music during instructional time. All ear buds should be out of ears!

Late/ Missing/Makeup Work:

Students are to place all late, missing, or makeup work in their period folder in the pink crate sitting by my desk at the beginning of the class period (before we go over BR together). This box will be cleaned out and graded **every Friday**. So if the student turns in the assignment on Monday it will not show up on Progress Book until the following Monday.

Students are responsible for finding out what work they missed. I will tell them, but only if asked! They will also be able to find missing work on the Google Classroom and on Progress Book.

Graded Assignments:

With the exception of test and quizzes all graded assignments will be placed in the student's period Crate, crates are under the cabinets. Students will be given the opportunity to go over and get their graded assignments during any free time they have in class. This box will be cleared out and papers will be trash after every interim report and nine weeks, approximately every 4.5 weeks.

All tests and quizzes will be passed back out by Mrs. Nicely, once all students have finished or made up the test or quiz. Tests and quizzes will not be passed back until that time.

Grading:

Unit Exams	50%
Assessments (Including: Quizzes, Essays, Labs, and Projects)	30%
Class work/Homework	20%

- Each nine week's grade comprises 20% of a student's final grade.
- The Mid-Term Exam and End of Course Exam each comprise 10% of a student's final grade.

Grading Scale:

The grading scale for Chillicothe High School can be found in the student handbook or online at

<http://www.chillicothe.k12.oh.us/1/Content2/studenthandbook>.

Late Work: Late work will be subject to the Board-adopted policy on assignments that are submitted late (to be reviewed in class).

- Regardless of the absence type (excused, unexcused, OSS, etc.), students are expected to make up work and be held accountable for learning all material they missed.
- Any student who is absent from school will receive one (1) additional day for every day he/she missed to make up his/her work for full credit (100%).
- Any student who exceeds the allotted time to turn in an assignment for full credit may still submit work late for partial credit.
 - Any student who turns in work up to 1 week late must at least be given the opportunity to earn 75% on that assignment.
 - Any student who turns in work between 1 and 2 weeks late must at least be given the opportunity to earn 60% on that assignment.
- The end of the 9 weeks is the cut off point for teachers to accept late work from students for full or partial credit unless the teacher decides to give the student an incomplete for the 9 weeks due to extenuating circumstances.
- **Lessons per 9 weeks**
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- **1st 9 weeks**
- Estimating Limits
- Techniques for Evaluating Limits
- Properties for Evaluating Limits
- One Sided Limits
- Limits that Fail to Exist
- Limits to Infinity
- Continuity
- Application of Limits
- Definition of the Derivative

- Differentiation Rules
- Derivatives of Trig Functions
- The Chain Rule
- Particle and Linear Motion Problems

- **2nd 9 weeks**
- Implicit Differentiation
- Derivative of Inverse Functions
- Inverse Trig Functions
- Derivatives of Inverse Trig Functions
- Derivatives of Exponential and Logarithmic
- Logarithmic Differentiation
- Critical Values
- Theorems about the Derivative
- The First and Second Derivatives and Curve Sketching
- Asymptotes of a Function and Curve Sketching
- Solving Max/Min Problems
- The Differential and Linear Approximation
- Related Rates
- L'Hopital's Rule

- **3rd 9 weeks**
- Antidifferentiation Rules and Techniques
- The Problem of Area
- Numerical Integration
- The Definite Integral
- Properties of the Definite Integral
- Integration of Exponential and Logarithmic Functions
- Slope Fields

- **4th 9 weeks**
- Area of Plane Regions
- Volumes – Disk/Washer Methods
- Cross Sectional Slicing
- Antidifferentiation by Parts
- Logistic Growth
- Lengths of Curves
- Improper Integrals

Performance Based Section: Writing

Assignments/Exams/Presentations/Technology

One or more of the End of Unit Exams may be Performance Based. According to the Ohio Department of Education, “Performance Based Assessments (PBA) provides authentic ways for students to demonstrate and apply their

understanding of the content and skills within the standards. The performance based assessments will provide formative and summative information to inform instructional decision-making and help students move forward on their trajectory of learning.” Some examples of Performance Based Assessments include but are not limited to portfolios, experiments, group projects, demonstrations, essays, and presentations.

CHS AP Calculus AB Course Syllabus

After you have reviewed the preceding packet of information with your parent(s) or guardian(s), please sign this sheet and return it to me so that I can verify you understand what I expect out of each and every one of my students.

Student Name (please print):

Student Signature:

Parent/Guardian Name (please print):

Parent/Guardian Signature:

Date:
