Calculus 2 (AP Calculus BC)

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Important Dates

Parent/Teacher Conferences:
August 30, 2018 / November 15, 2018 / January 31, 2019 / February 7, 2019

AP Calculus Exam, Tuesday, May 14, 2019

Introduction

This course prepares students to take the Advanced Placement (AP) Calculus BC exam, giving students the opportunity to receive credit for Calculus I and Calculus II at almost all colleges throughout the United States.

Calculus is a branch of mathematics that deals with rates of change. Its roots go back as far as Ancient Greece and China, but calculus as we know it today began with Newton and Leibnitz in the 17th century. Today calculus is used extensively in many areas of science.

In the sciences, many processes involving change, or related variables, are studied. If these variables are linked in a way that involves chance, and significant random variation, statistics is one of the main tools used to study the connections. But, in cases where a deterministic model is at least a good approximation, calculus is a powerful tool to study the ways in which the variables interact. Situations involving rates of change over time, or rates of change from place to place, are particularly important examples.

As a general rule, if you are planning to get a bachelor or advanced degree in science, you will probably need one or more courses in calculus. If you are taking courses in the social sciences or life sciences, you will probably need one or more courses in statistics; and degrees in physics, engineering, astronomy, mathematics, or computing science (and some other subjects) will require additional mathematics courses beyond the typical sequence of calculus 1, calculus 2, and calculus 3(or typically referred to as multivariable calculus). Physics, astronomy, mathematics, and engineering make

particularly heavy use of calculus; it is difficult to see how any of those disciplines could exist in anything like its modern form without calculus. However, biology, chemistry, economics, computing science, and other sciences use calculus too. Many faculties of science therefore require a calculus course from all their students; in other cases you may be able to choose between, say, calculus, statistics, and computer programming.

It should be understood that there is more to mathematics than calculus. Some mathematics courses may have first-year calculus as a prerequisite to ensure that students taking those courses have a certain level of mathematical sophistication, but may not actually use calculus at all.

Calculus is not an end; it's a beginning! It is one of man's crowning intellectual achievements in the history of ideas, both in terms of its tremendous usefulness in science and the beauty with which it captures the subtle patterns of change that underlie all of what we can see, hear, and measure.

Course Description: (12th)

An Advanced Placement (AP) course in calculus consists of a full high school academic year of work that is comparable to a calculus course in colleges and universities. AP Calculus 2 will follow the topics outlined by the College Board for AP Calculus BC, along with additional topics that the instructor deems fit to include. The course is primarily concerned with developing students' understanding of the concepts of calculus and providing experience with its methods and applications.

Outline of Required Topics: (Taken from College Board-Calculus BC)

Review of Calculus AB topics to include, but not limited to:

- Functions and Graphs, Evaluating and Using Limits, Asymptotic and Unbounded Behavior
- Derivatives: At A Point, Concept & Computation, First & Second Derivatives Plus Curve Sketching, Mean Value Theorem, the Natural Logarithmic Function and Applications of Derivatives
- Integrals: Riemann Sums, Trapezoidal Method, Definite Integrals, The Fundamental Theorem of Calculus
- Antidifferentiation: Basic Functions, U-substitutions, and the Natural Logarithmic Function

• Volumes of Solids with Known Cross-sections and Disk/Washer Methods and other applications

Topics specific to Calculus BC Additional Applications of Integration
• Volume by Cylindrical Shells
• Arc Length and Surfaces of Revolution
• Physics Applications: Center of Mass, Work, Momentum, and other topics
• Economics and Biology Applications
• Probability
• Hyperbolic Functions

Advanced Integration Techniques
• Integration by Parts
• Trigonometric Integrals
• Trig Substitution
• Partial Fractions
• All Indeterminate Forms and L'Hôpital's Rule
• Improper Integrals
• Integration using Tables and Computer Algebra Systems

Infinite Series
• Sequences
• Series and Convergence
• The Integral Test and p-Series
• Comparisons of Series • Alternating Series
• The Ratio and Root Tests
• Taylor Polynomials and Approximations
• Power Series
• Representations of Functions by Power Series
• Taylor and Maclaurin Series
• Applications of Taylor Polynomials

Parametric Equations and Polar Coordinates
• Plane Curves and Parametric Equations
• Parametric Equations and Calculus

• Polar Coordinates and Polar Graphs
• Area and Arc Length in Polar Coordinates
• Conics Sections

More on Differential Equations
• Find numerical solutions of differential equations using Euler's Method
• Solve logistic differential equations and use them in modeling
• Solve Linear Differential Equations
• Predator-Prey Systems
• Mixture

Vector-Valued Functions
• Vectors in Two and Three Dimensions
• Vector Functions and their Derivatives
• Projectile Motion and Other Curvilinear Motion: Velocity and Acceleration

Possible Additional Topics that could be included in the course (These are topics typically studied in Calculus 3): • Partial Derivatives • Multiple Integrals • Vectors and the Geometry of Space • Vector Calculus

The Role of Technology in AP Calculus:
Technology is designed to make our lives as mathematicians easier; yet, technology is not a substitute for mathematical understanding and proficiency. Students are expected, both by the instructor and by College Board, to understand the underlying mathematical concepts associated with the use of technology. This course will involve the use of the graphing calculator and various computer programs to give students mathematical understanding across multiple representations.

Required Daily Materials:
• Textbook: Calculus Of A Single Variable-11th edition (Larson and Edwards)
• Pens, Pencils, and Paper.
• A Three-Ring Binder is strongly suggested for organization of class materials.

Grading:

A preliminary average is determined by dividing the total points earned by the total points possible. Five points will be added to one's preliminary quarter average in order to determine the final quarter grade.

Students will earn points as follows:

- TESTS <100 points each; 60% of grade>
- HOMEWORK <100 points, total; 10% of grade>

  Daily homework assignments are expected to be completed in good form and to show appropriate detail. You will be awarded 3 points for satisfactory work based primarily on determination of good faith attempt. For unsatisfactory attempts, a grade of 0 will be given. If you are unable to complete an assignment due to extraordinary circumstances, please discuss this with me before 8:10 a.m. For an excused absence, you will be given a 0 until the assignment and class notes for the day(s) missed have been satisfactorily completed. Once completed, the 0 will be removed. Make-up assignments do not earn homework-attempted points except in special or pre-arranged cases. It is permissible to have another student turn in one's homework by no later than the date due and still earn the homework attempted points. Students who will miss class due to a school-sponsored (or supported) event or by checking out during the school day are expected to turn in the assignment on time.

- QUIZZES/OTHER ACTIVITIES <25 points each; 30% of grade>

Tests will be given roughly every three or four weeks and will always be announced in advance. Quizzes may be given with or without warning. Most of the time, homework will be assigned daily and must be completed before the next class meeting. On-time completion is crucial because the assignment will often form the basis for the next class. As you complete each assignment, remember to pay close attention to details, justifying your steps, and show all of your work. The homework is designed to provide reinforcement for previously taught content, development of skill, and enrichment opportunities.

Additional Information:

When a test requires the use of a graphing calculator, the TI-Nspire will be the calculator supplied by the teacher. Tests will normally be announced at least three days in advance. I believe we all "learn from our mistakes", therefore

students are given the opportunity to come in either before or after school and earn back a percentage of the points missed by correcting all mistakes made on the test, with my assistance as needed. Usually I allow about 1 week for corrections to be completed. Test corrections are allowed on almost all tests during the first three quarters, Although tests count considerably more than homework in the overall course grade, homework is the most important component of this course. ***If a student does not complete the assigned homework, she/he will have a difficult time succeeding in this course since AP Calculus is a college level course.***

Note: A Semester Exam will be administered during the second quarter. Students will not take a Semester Exam during the fourth quarter due to taking the AP Exam. The score on the AP Exam will not be included in the fourth quarter average. College Board does not release AP Exam scores until the first week of July.

Collaboration and Additional Instruction:

Students are expected to participate in class everyday. Participation may include, but is not limited to: discussion, presentation, cooperative work, and individual work. Being able to do mathematics as an individual is a not a sufficient condition for being mathematically successful. Students must be able to discuss the daily mathematics with each other and the instructor using correct mathematical terminology. Collaboration between students outside of class is encouraged and necessary in advanced mathematics courses.

Note: Collaborate does not mean copying someone's work either on one particular problem or on a set of problems.

Calculus is a great human achievement that I hope each of you will come to appreciate this year. I am excited about teaching this course and hope you are as excited about taking it. You have been preparing yourselves for college all your lives. If you do well in this course, you will have an advantage over those admitted to college without AP experiences. I look forward to working closely with each of you throughout the academic year to ensure your success in this course and in your future mathematical education. I will be available before school (I usually arrive around 7:15) , Tuesday through Fridays. . Waiting until the end of the grading period is not the most advantageous time for help. Another powerful source of help is your classmates. Students may want to form study groups that

meet regularly to share class notes, to discuss homework solutions, and to study for exams. Online sources for help are referenced in your textbook. Other sources will be shared in class.

Guidelines and Expectations

BE PROMPT-BE PREPARED-BE POLITE

It is absolutely necessary that you be in class on a regular basis. You will be amazed at how much you will miss in just one day. Absences due to illness, family situations, or school initiated activities do not excuse one from completing the homework assigned during the absence or from learning the concepts taught during the absence. Find a buddy in your class who will notice when you are missing and will take particularly good notes to share with you. It is your responsibility to copy the class notes and complete all assignments that were due during your absence. If you are absent the day of a test, you are expected to make arrangements to make up that test on the day you return. Always bring the textbook (or e-book), writing instruments, paper, and notebook to class each day. The notebook is for you to store, in an organized fashion, the daily class notes, in-class activities, and homework assignments. Use whatever is effective for you - except DO NOT store papers in your textbook. You are expected to be in your seat and ready to begin when the tardy bell rings. Excessive tardies may result in detention. Do not work on any other material in class without permission. Inappropriate materials or work interfering with one's participation in class will become the property of the teacher. Inappropriate use of your graphing calculator or computer will not be tolerated. Cellular phones and other electronic communication devices are NOT to be powered on, heard, used, or visible (this includes headphones, etc.) upon entering the classroom and during the class period. Cell phones and similar electronic devices that are discovered powered on, seen, or heard will be confiscated as according to school policy. Students who allow electronic devices to become a distraction may face disciplinary measures beyond confiscation. Students discovered to be in violation of this policy during a test may receive a grade of zero. Most of the time, homework will be assigned daily and must be completed before the next class meeting. On-time completion is crucial because the assignment will often form the basis for the next class. As you complete each assignment, remember to pay close attention to details, justifying your steps, and show all of your work. The homework is designed to provide reinforcement for previously taught content, development of skill, and enrichment opportunities. It is reasonable to assume that most students may need to spend on average an hour or so

outside of class each day in preparation for the next day. (Please let me know if any particular daily assignment requires you to spend an unreasonable amount of time to complete.) There will also be times when you may be given an extended homework assignment comprised of a plethora of closely-related problem types. Typically you will be given a few days to complete the extended assignment before it is collected and evaluated. Developing mature work habits is critical for success in this course. It is everyone's responsibility to make academic contributions and to help others learn. Always listen silently when it is someone else's turn to talk and stay focused on the current learning activity. I expect you to devote your best effort to every task associated with this course. Remember, you are taking a college level course in mathematics!