AP®Calculus AB Course Syllabus[C2]

Mrs. Dowling

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Major Text

Larson, Ron, Bruce H. Edwards. *Calculus of a Single Variable. 10*th ed. Boston/New York: Brook/Cole
    Cengage Learning, 2014.

Textbook Replacement Cost   **$150.50**
Fast Track to a 5 Replacement Cost   **$15.00**

Course Description

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*. An AP course in calculus consists of a full high school academic year of work that is comparable to calculus courses in colleges and universities. It is expected that students who take an AP course in calculus will seek college credit, college placement, or both, from institutions of higher learning. (apcentral.collegeboard.com)

Prerequisites

Before studying calculus, all students should complete four years of secondary mathematics designed for college-bound students: courses in which they study algebra, geometry, trigonometry, analytic geometry, and elementary functions. (Algebra 1, Geometry, Algebra 2, Pre-Calculus). These functions include those that are linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, and piecewise defined. In particular, before studying calculus, students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, and so on) and know the values of the trigonometric functions of the numbers 0, $\pi/6$, $\pi/4$, $\pi/3$, $\pi/2$, and their multiples. (apcentral.collegeboard.com)

Instructional Philosophy

Calculus AB is primarily concerned with developing the students' understanding of the concepts of calculus and providing experience with its methods and applications. The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The focus of the course is neither manipulation nor memorization of an extensive taxonomy of functions, curves, theorems, or problem types. Technology should be used regularly by students and teachers to reinforce the relationships among the multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results. Through the use of the unifying themes of derivatives, integrals, limits, approximation, and applications and modeling, the course becomes a cohesive whole rather than a collection of unrelated topics. These themes are developed using all the functions listed in the prerequisites. (apcentral.collegeboard.com)

Course Goals (apcentral.collegeboard.com)

- Students should be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.
- Students should understand the meaning of the derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems.
- Students should understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change and should be able to use integrals to solve a variety of problems.
- Students should understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Students should be able to communicate mathematics both orally and in well-written sentences and should be able to explain solutions to problems.
- Students should be able to model a written description of a physical situation with a function, a differential equation, or an integral.
- Students should be able to use technology to help solve problems, experiment, interpret results, and verify conclusions.
- Students should be able to determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- Students should develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.
- Gifted students will develop advanced research skills and methods. Curriculum for gifted students should allow for the in-depth learning of self-selected topics within the area of study.
- Gifted students will develop and practice creative thinking and creative problem-solving skills with a variety of complex topics within the area of study.
- Gifted students will develop and practice critical thinking and logical problem-solving skills in the pertinent academic area.
- Gifted students will develop an understanding of self and how their unique characteristics may influence interactions with others.

Course Assessment

Nine Weeks Grade = 60% (Tests) + 25% (Quizzes) + 15% (Daily)
1st Semester Grade = (1st 9 weeks + 2nd 9 weeks) ÷ 2 x 80% + Semester Exam x 20%
2nd Semester Grade = (3rd 9 weeks + 4th 9 weeks) ÷ 2

Materials Required

1. TI-84 Plus or TI-84 Plus CE
2. 3-ring binder
3. Planner
4. Notebook paper
5. Pencils only
**Project supplies will be announced as needed

Classroom Rules and Expectations

1. Bring your supplies to class every day.
2. Be on time, attentive and involved.
3. Be respectful to everyone.
4. Put all trash in the trash can as you leave the classroom.
5. No late work will be accepted

Extra Help

Extra help is available during online office hours. This will be posted in Google Classroom.

Make-up Work

1. All make-up work is to be completed within three days of returning to school. If the absence is excused, credit will be given; no credit is given for an unexcused absence, unless cleared through an administrator.
2. Please see me to schedule make-up tests and quizzes.
3. It is *your* responsibility to get make up work. Please let me know if you have any questions.
4. NO late work will be accepted.

**Recording a meeting without the consent of all participants may be illegal and actionable. You should obtain consent to record a meeting from all participants, including external guests and guests who join late.

AP®Calculus AB Course Outline [C2]

Each of my students has either a TI-83 Plus, TI-84, or TI-89 graphing calculator of his or her own. In my class, we use graphing calculators to explore, discover, and reinforce the concepts of calculus. The zoom feature is used to explore the behavior of many functions and limitations graphing on the calculator. This is used to stress that understanding the functions in coordination with technology is best. Students are guided through looking at various problems using the graphing calculator, solving analytically, and then discussing results during various sections throughout the year. Students may use the graphing calculators on some but not all assessments. [C3] [C5]

Chapter 1 - Prerequisites to Calculus

Summer work *Quiz day 1*

This review of pre-calculus topics including symmetry, intercepts, families of graphs, rates of change, functions, composite functions, trig functions, unit circle, trig identities, properties of logarithms and exponents along with basic algebra manipulations are to be reviewed over the summer.

Chapter 2 – Limits and Continuity

2.5 weeks

Objectives: The student will be able to:

1. evaluate limits numerically, algebraically, and graphically including one sided limits (2.1)
2. find limits involving infinity by finding equations of vertical and horizontal asymptotes (2.2)
3. determine whether a function is continuous at a point (2.3)
4. classify discontinuities as: "removable", "jump", or "infinite" (2.3)
5. understand the "Intermediate Value Theorem" (2.3)

Chapter 3 – Derivatives

5.5 weeks

Objectives: The student will be able to:

1. find the derivative of a function using the definition of a derivative (3.1)
2. find whether a function is differentiable at a point (3.1)
3. use the basic differentiation rules: the derivative of a sum/difference and the power rule (3.3)
4. use the basic differentiation rules: the product rule, the quotient rule, higher order derivatives, and derivative notation (3.3)
5. use the Chain Rule (3.6)

Test #2

6. determine the difference between a tangent line and a normal line (3.3)
7. determine the difference between an average rate of change and an instantaneous rate of change (2.4)
8. graph the derivative from data (3.1)
9. solve rectilinear motion problems involving the relationship between Position, Velocity, Acceleration, and "Jerk" (3.4, 3.5)
10. understand the concept of Marginal Profit, Marginal Cost, and Marginal Revenue (3.4)
11. determine if a function is differentiable and how differentiability implies local linearity (3.2)

Test #3

11. use implicit differentiation (3.7)
12. use the derivatives of all six Trigonometric Functions (3.5)
13. use the derivatives of Exponential Functions (3.6)
14. use the derivatives of Logarithmic Functions (3.9)
15. use the derivatives of Inverse Trigonometric Functions(3.8)

Test #4

Chapter 4 – Applications of Derivatives

3.5 weeks

Objectives: The student will be able to:

1. understand and apply the Extreme Value Theorem (4.1)
2. understand and apply Rolle's Theorem and Mean Value Theorem (4.2)
3. use the First and Second Derivative Test (4.3)
4. connect F'(x) and F"(x) with the graph F(x)
5. sketch curves

Test #5

6. solve maximum and minimum problems (4.4)
7. solve related rate problems (4.6)

Test #6

Chapter 5, 6, & 7 – The Indefinite & Definite Integral

5. weeks

Objectives: The student will be able to:

1. evaluate indefinite integrals using the Power Rule and the Chain Rule for integration (6.1)
2. use integration by "u substitution" (6.1)
3. evaluate definite integrals including exponential, logarithmic, and trigonometric (5.3)
4. understand and apply the Fundamental Theorems of Integral calculus (5.4)

Test #7

5. approximate areas under the curve using LRAM, RRAM, MRAM, and Trapezoids (5.1 & 5.5)
6. understand the Riemann Sum definition (5.2)
7. find the net distance traveled (7.1)
8. find the total distance traveled (7.1)
9. calculate the average value of a function (5.3)
10. calculate area between curves (7.2)

Test #8
End of 1ˢᵗ Semester

Chapter 6 & 7 – Applications of Integrals

5 weeks

Objectives: The student will be able to:

1. find the volumes of solids of revolution using the "Disk Method" (7.3)
2. find the volumes of solids of revolution using the "Washer Method" (7.3)
3. find volumes of solids with known cross sections (7.3)

Test #9

4. solve differential equations of order 1 by the method of "separation of variables"(6.1)
5. solve differential equations involving Growth and Decay Applications (6.4)
6. solve differential equations involving Newton's Law of Cooling Applications (6.5)
7. understand slope fields (6.1)
8. sketch a slope field given a differential equation (6.1)

Test #10

Review – AP problems and Practice Examinations

9 weeks

4 multiple choice AP exams will be given at this time. The students will work together in groups. In addition, many Free Response AP Exam questions will be used. Also, the guidelines for a "Calculus" notebook will be given. Definitions, examples and explanations of each topic will be displayed in the notebook. The students will use the notebook to help prepare for the AP exam.

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

*Throughout the year and during the review period, I use many free response problems from previous exams. The students must work them on paper and or calculator and then discuss their answers in groups. [C4]

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