AP Calculus AB - Syllabus

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Introduction

About. The goal of this course is to equip students with the ability to understand, appreciate, and apply the core concepts of AB calculus: limits, derivatives, integrals, and the Fundamental Theorem of Calculus. It is expected that students enrolling in this course will have already mastered algebra, trigonometry, and precalculus. By the end of the course, students will be prepared to take Collegeboard's AP Calculus AB exam, which may grant them college credits in introductory calculus depending on their score and the credit-granting policies of the particular college. As such, the curriculum of this course will mirror the topics covered on the exam, and students will receive extensive exam practice in the months leading up to the exam.

Textbook. The textbook *Stewart's Calculus: Early Transcendentals* will be recommended for reference and supplemental readings. Students will be provided with PDF copies of this textbook.

Unit 1: Limits and Continuity (Sept)

1.1 | *Evaluating limits through graphs, tables, and direct substitution*

1.2 | *Evaluating limits using the Squeeze Theorem*

1.3 | *Evaluating limits at infinity and infinite limits; interpreting results in terms of asymptotes*

1.4 | *Selecting from many possible procedures to evaluate a limit when no prior guidance is provided*

1.5 | *Classifying functions as continuous or discontinuous*

1.6 | *The Intermediate Value Theorem*

Unit 2: Differentiation: Definition and Fundamental Properties (Sept - Oct)

2.1 | *Average and instantaneous rates of change; slopes of secant and tangent lines; the derivative; estimating the derivative at a point*

2.2 | *Derivative as a function, graphing the derivative given a function, graphing a function given its derivative*

2.3 | *Relationship between differentiability and continuity*

2.4 | *Power rule, constant / sum / difference / constant multiple rules*

2.5 | *Derivatives of sine / cosine / exponential / logarithm*

2.6 | *Derivatives of tangent / cotangent / secant / cosecant*

2.7 | *Product rule, quotient rule*

Unit 3: Differentiation: Composite, Implicit, and Inverse Functions (Oct)

3.1 | *The chain rule*

3.2 | *Implicit differentiation*

3.3 | *Differentiating inverse trigonometric functions*

3.4 | *Differentiating general inverse functions*

3.5 | *Selecting procedures for calculating derivatives*

3.6 | *Calculating higher-order derivatives*

Unit 4: Contextual Applications of Differentiation (Nov)

4.1 | *Interpreting the meaning of the derivative in real-life contexts*

4.2 | *1-dimensional position/velocity/acceleration*

4.3 | *Related rates (including applied contexts other than motion)*

4.4 | *Approximating function values near a point using local linearization*

4.5 | *L'Hopital's Rule*

Unit 5: Analytical Applications of Differentiation (Nov - Dec)

5.1 | *Mean Value Theorem*

5.2 | *Global vs local extrema; critical points*

5.3 | *Determining intervals on which a function is increasing or decreasing; first derivative test*

5.4 | *Concavity; second derivative test*

5.5 | *Sketching the second derivative and higher derivatives*

5.6 | *Applied optimization problems*

5.7 | *Optimization of implicitly defined functions*

Unit 6: Integration and Accumulation of Change (Dec - Jan)

6.1 | *Sum rules for powers 1 through 3*

6.2 | *Finite Riemann sums; midpoint/trapezoidal rules*

6.3 | *Infinite Riemann sums*

6.4 | *Definite integral notation; properties of integrals*

6.5 | *Fundamental Theorem of Calculus; indefinite integral notation for antiderivatives; integrals of elementary functions*

6.6 | *Integration by substitution*

6.7 | *Integration by long division; integration by completing the square*

6.8 | *Selecting techniques for integration*

Unit 7: Differential Equations (Jan)

7.1 | *Modeling with differential equations, verifying solutions for differential equations*

7.2 | *Sketching slope fields, reasoning using slope fields*

7.3 | *General solutions of separable differential equations, particular solutions of separable differential equations*

7.4 | *Exponential models with differential equations*

Unit 8: Applications of Integration (Jan - Feb)

8.1 | *Average value of a function on an interval*

8.2 | *Position/velocity/acceleration*

8.3 | *Accumulation functions and definite integrals in applied contexts*

8.4 | *Area between two curves defined as functions of x; area between two curves defined as functions of y; area between curves that intersect at more than two points*

8.5 | *Volumes with square/rectangular/triangular/semicircular cross sections*

8.6 | *Volumes of revolution around x/y/other axes using the disc method; volumes of revolution around x/y/other axes using the washer method*

Unit 9: Preparation for the AP Exam (March - May exam date)

9.1 | *Recognizing all the different ways a type of question might be stated*

9.2 | *Showing work/steps in free response*

9.3 | *Pacing*

9.4 | *Targeted studying*

9.5 | *Practice exams*