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# PETERS TOWNSHIP HIGH SCHOOL

## COURSE SYLLABUS: AP CALCULUS AB

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### **Course Overview and Essential Skills**

AP Calculus AB is structured around three big ideas: limits, derivatives, and integrals and the Fundamental Theorem of Calculus. The concept of limits is foundational; the understanding of this fundamental tool leads to the development of more advanced tools and concepts that prepare students to grasp the Fundamental Theorem of Calculus, a central idea of AP Calculus.

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 to representational approach to calculus, with concepts, results and problems being expressed graphically, numerically, analytically, and verbally. The connections among these representations also are important.

Broad concepts and widely applicable methods are emphasized. The focus of the course is neither manipulation nor memorization of an extensive taxonomy of functions, curves, theorems, or problem types. Thus, although facility with manipulation and computational competence are important outcomes, they are not the core of this course.

Technology is used regularly 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.

### **Course Textbook and Required Materials**

- Title: *Calculus: Graphical, Numerical, Algebraic* (5<sup>th</sup> edition, 2016) ISBN:0-13-331162-7
- Other: *Test Prep Series for AP Calculus* ISBN: 0-13-331458-8
- TI-83 or TI-84 Graphing Calculator
- Binder

### **Course Outline of Material Covered:**

<b>Unit or Topic</b>	<b>Concepts/Skills/Resources</b>	<b>Timeframe</b>
Chapter 2: Limits and their properties	Finding limits Graphically and Numerically Evaluating limits analytically Continuity and one-sided limits Limits at infinity	3 weeks
Chapters 3 and 4: Differentiation	The derivative and the tangent line problem Basic differentiation rules and rates of change Product and Quotient rules and higher-order derivatives The chain rule Implicit Differentiation Derivatives of Inverse Functions	7 weeks

	Related Rates	
Chapter 5: Applications of Differentiation	Extrema on an interval Rolle's Theorem and Mean Value Theorem Increasing and decreasing Functions and the first derivative test Concavity and the second derivative test Curve Sketching Optimization problems Differentials	6 weeks
Chapter 6: Integration	Indefinite Integration Area Riemann Sums and Definite Integrals The Fundamental Theorem of Calculus Integration by Substitution	6 weeks
Chapter 7: Differential Equations	Slope fields Growth and Decay Separation of Variables	3 weeks
Chapter 8: Applications of Integration	Area of a region Volume: Disc, Washer, and shell Methods	4 weeks
Review for the AP Exam	Multiple Choice/Free Response review	4 weeks
Projects	Application based Movie: <b><i>Stand and Deliver</i></b>	3 weeks

***\*Depending on the needs of the class or changes in the school year, the course outline is subject to change.***