PETERS TOWNSHIP HIGH SCHOOL
COURSE SYLLABUS: AP CALCULUS BC

Course Overview and Essential Skills

AP Calculus BC is a challenging class which will prepare students to take the AP Calculus BC Exam in May where they can earn college credit for Calculus I and Calculus II. The course covers the entire AB curriculum before January. BC material will be covered from January to March. Most of April will be spent preparing for the AP exam. AP Calculus BC covers differential and integral calculus, including concepts and skills of limits, derivatives, definite integrals, the Fundamental Theorem of Calculus, and series. Students learn to approach calculus concepts and problems when they are represented graphically, numerically, analytically, and verbally, and to make connections among these representations. A common question is "What is the difference between AP Calculus AB and AP Calculus BC?" AP Calculus BC is an extension of AP Calculus AB: the difference between them is scope, not level of difficulty.

AP Calculus BC includes the AB topics of techniques and applications of the derivative, the definite integral, and the Fundamental Theorem of Calculus as well as the BC topics such as parametric, polar, and vector functions, and series. It is equivalent to **one year** of calculus at most colleges and universities. Students who take the BC AP test will receive an exam score from 1 to 5, and an additional "AB subscore" from 1 to 5 on the subset of exam questions which are included in the AP Calculus AB topics. Students earning a score of 4 or 5 will generally earn college credit, satisfy "in-major" degree requirements, and receive advanced placement as follows:

AB Exam Score or AB Subscore of BC Exam (of 4 or 5): 1 semester credit for Calculus I

BC Exam Score (of 4 or 5): 1 semester credit for Calculus I, and 1 semester of credit for Calculus II

Course Textbook and Required Materials

- Title: Calculus for AP with CalcChat and CalcView ISBN#: 978-1-305-94801-3
- Other: Fast Track to a 5 Workbook ISBN# 978-1-305-96658-1
- Website www.LarsonCalculusforAP.com contains videos explaining concepts and proofs from the book, three-dimensional graphs, and sample scoring for AP Calculus free-response questions.
- Website www.CalcView.com contains video solutions of selected exercises.
- Website www.CalcChat.com provides free step-by-step solutions to all odd-numbered exercises (also you can chat with a tutor, at no charge, during the hours posted at the site)
- TI-83 or TI-84 Graphing Calculator

Course Outline of Material Covered:

Unit or Topic	Concepts/Skills/Resources	Timeframe
Limits and their properties (Chapter 1)	Finding limits Graphically and Numerically Evaluating limits analytically Continuity and one-sided limits Limits at infinity • estimate limits from graphs or tables of data • use a graphing calculator to evaluate limits • identify the nonexistence of limits	11 days

	• understand asymptotes in terms of graphical behavior • describe asymptotic behavior in terms of limits involving infinity • define and apply Intermediate Value Theorem Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	
Differentiation (Chapter 2)	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 Related Rates Newton's method • define derivative • relate differentiability and continuity • apply derivative to determine equation of tangent line at a point • determine instantaneous rate of change as the limit of average rate of change • approximate rate of change from graphs and tables of values Model real-world data Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	12 days
Applications of Differentiation (Chapter 3)	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	16 days

	• use and apply first derivative test, second derivative test, concavity, and inflection • analyze and interpret all concepts graphically • analyze planar curves given in parametric form, polar form, and vector form Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	
Integration (Chapter 4)	Indefinite Integration Area Riemann Sums and Definite Integrals The Fundamental Theorem of Calculus Integration by Substitution • define integrals and apply to basic formulas • apply the integral of a rate of change to setting up an approximating Riemann sum and represent its limit as a definite integral • apply the Fundamental Theorem to evaluate definite integrals and provide a graphical analysis of functions so defined Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	16 days
Differential Equations (Chapter 5)	Slope fields Growth and Decay Separation of Variables The logistic equation • understand the geometric interpretation of differential equations via slope fields and the relationship between slope fields and derivatives of implicitly defined functions • determine numerical solution of differential equations using Euler's method Graphing Calculator	9 days

	CalcChat.com (Homework Help) Fast track to a Five (workbook)	
Applications of Integration (Chapter 6)	Area of a region Volume: Disk and Washer Methods Arc Length • adapt knowledge and techniques to solve application to model physical, social, or economic situations • calculate volume of a solid of revolution including disc, washer, and shell method. Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook) Wooden models of solids	10 days
Integration Techniques (Chapter 7)	Integration by parts Partial fractions Indeterminate forms L'Hopital's Rule Improper integrals • determine antiderivatives by substitution of variables (including change of limits), parts, and simple partial fractions (nonrepeating linear factors only) • evaluate improper integrals (as limits of definite integrals)	17 days
Infinite Series (Chapter 8)	Sequences Series and convergence Integral and P-series test Comparisons of series Alternating Series The ratio and root tests Taylor polynomials and approximations Power Series Maclaurin Series • define series as a sequence of partial sums, and convergence is defined as the limit of the sequence of partial sums • apply series of constants (including motivating	29 days

	examples with decimal expansion) • apply geometric series, harmonic series, alternating series, terms of series, and its use in • testing the convergence of p-series • apply Taylor polynomial approximation with graphical demonstration of convergence • apply the general Taylor series centered at x = a • apply Maclaurin series for the functions • manipulate Taylor series and shortcuts to computing Taylor series, including • differentiation, antidifferentiation, and the formation of new series from known series • apply defined power series and radius of convergence Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	
Parametric and Polar (Chapter 9)	Polar and parametric derivatives Area in polar and parametric functions Vector valued functions Velocity and acceleration • analyze planar curves given in parametric form, polar form, and vector form • determine derivative of parametric, polar, and vector functions • determine the area of parametric, polar graphs Graphing Calculator CalcChat.com (Homework Help) Fast track to a Five (workbook)	19 days
Prepare/Review for the AP Calculus BC Exam	Prior released AP Exam Questions Fast track to a 5 Workbook	24 days
After AP Exam Topics	After AP Exam, we will watch the movie Stand and Deliver. (2 days) Discuss solutions to the released Free Response Question. (4 days)	17 days

	Introduce some topics in Calculus III	

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