GREAT NECK PUBLIC SCHOOLS
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Curriculum Profile: AP Calculus BC

Department	Mathematics	
Course Name	AP Calculus BC	
Course Length	1 Year	
High School Credits	1	
Description	AP Calculus BC is roughly equivalent to the first and second semester college calculus courses devoted to topics in differential and integral calculus. The AP Calculus AB course covers topics in these areas, including concepts and skills of limits, derivatives, definite integrals, and the Fundamental Theorem of Calculus. The course teaches students to approach calculus concepts and problems when they are represented graphically, numerically, analytically, and verbally, and to make connections amongst these representations. Students learn how to use technology to help solve problems, experiment, interpret results, and support conclusions. AP Calculus BC applies the content and skills learned in AP Calculus AB to parametrically defined curves, polar curves, and vector-valued functions; develops additional integration techniques and applications; and introduces the topics of sequences and series.	
Target/eligible students	Completion of Precalculus Honors	
State Learning Standards Link(s)	AP Calculus BC Course and Exam Description	
Primary texts and materials	College Board CED, Calculus Early Transcendentals by Howard Anton	
Scope/Sequence	● Overview /Standards	AP Calculus BC is the high school equivalent of Calculus 1 and 2. The course covers three major ideas: ● BIG IDEA 1: CHANGE (CHA) Using derivatives to describe rates of change of one variable with respect to another or using definite integrals to describe the net change in one variable over an interval of another allows students to understand change in a variety of contexts. It is critical that students grasp the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus—a central idea in AP Calculus. ● BIG IDEA 2: LIMITS (LIM) Beginning with a discrete model and then considering the consequences of a limiting case allows us to model real-world behavior and to discover and understand important ideas, definitions, formulas, and theorems in calculus: for example, continuity, differentiation, and integration. ● BIG IDEA 3: ANALYSIS OF FUNCTIONS (FUN) Calculus allows us to analyze the behaviors of functions by relating limits to differentiation, integration, and infinite series and relating each of these concepts to the others.
Unit 1: Limits and Continuity	CHA.2, LIM.1, LIM.2, LIM.3, FUN.3	Students will define limits using limit notation, estimate limit values from graphs and tables, determine limits using algebraic manipulation, apply the squeeze theorem, and select procedures for using limits. They will explore types of discontinuity, define continuity at a point and connect infinite limits and asymptotes. Students will work with the Intermediate Value Theorem.

Unit 2: Differentiation: Definition and Fundamental Properties	CHA.1, CHA.2, CHA.4, LIM.1, FUN.1, FUN.3	Students will define average and instantaneous rates of change at a point, define the derivative of a function, estimate derivatives, and connect differentiability and continuity. They will apply the power rule, product rule, quotient rule, and the derivatives of other types of functions.
Unit 3: Differentiation: Composite, Implicit and Inverse Functions	FUN.1, FUN.3	Students will apply the chain rule, define and use implicit differentiation, differentiate inverse functions, differentiate inverse trigonometric functions, and select procedures for calculating derivatives.
Unit 4: Contextual Applications of Differentiation	CHA.1, CHA.2, CHA.3, LIM.3	Students will interpret the meaning of derivatives in context, connect position, velocity and acceleration graphs, use rates of change in applied contexts and solve problems involving related rates. They will approximate values of a function using local linearity and linearization. They will use L'Hospital's Rule for determining limits in indeterminate forms.
Unit 5: Analytical Applications of Differentiation	FUN.1, FUN.2, FUN.3	Students will use the mean value theorem, extreme value theorem and classify local and global extrema. They will use the first and second derivative tests and apply these concepts in optimization problems.
Unit 6: Integration and Accumulation of Change	LIM.1, LIM.2, CHA.4, FUN.1, FUN.2, FUN.3, FUN.4	Students will explore accumulations of change, approximate areas of Riemann sums, and interpret the behavior of accumulation functions. They will apply the Fundamental Theorem of Calculus and apply the properties of definite integrals. They will find antiderivatives and evaluate indefinite integrals. They will select proper techniques for antidifferentiation. Students will integrate using integration by parts, linear partial fractions and evaluate improper integrals.
Unit 7: Differential Equations	FUN.1, FUN.2, FUN.3, FUN.4	Students will model situations with differential equations and verify solutions for differential equations. They will sketch slope fields and find general/particular solutions using separation of variables. Students will approximate solutions using Euler's Method. They will work with logistic models with differential equations.
Unit 8: Applications of Integration	CHA.1, CHA.2, CHA.3, CHA.4	Students will find the average value of a function on an interval, connect position, velocity and acceleration graphs using integrals, and use accumulation functions and definite integrals in applied contexts. They will find the area between curves as a function of x and y and find the area between curves that intersect at more than two points. They will find volume with cross sections, with the disc method and with the washer method. Students will find the arc length of a smooth planar curve.
Unit 9: Parametric Equations, Polar Coordinates, and Vector-Valued Functions	CHA. 1, CHA.2, CHA.3, FUN.1, FUN.2	Students will define and differentiate parametric equations. They will determine the second derivatives of parametric equations, find the arc lengths of curves given by parametric equations, define, differentiate and integrate vector-valued functions. Students will solve motion problems using parametric and vector-valued functions, define polar coordinates and differentiate in polar form. They will also find the area of a polar region bounded by single or multiple curves.
Unit 10: Infinite Sequences and Series	LIM.1, LIM.2, LIM.3	Students will define convergent and divergent infinite series. They will use the nth term test, integral test, comparison test, alternating series test and ratio test. Students will find the Taylor polynomial approximation of functions, the radius and interval of convergence of a power series, the Taylor or Maclaurin Series for a function and represent functions as power series.
Additional Notes	*Sequencing of topics may vary.	