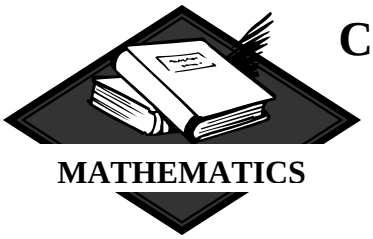
Parent / Student Course Information



MATHEMATICS

ADVANCED PLACEMENT CALCULUS AB

Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.

COURSE DESCRIPTION
This course is a study of differentiation and integration techniques with an emphasis on applications. It is equivalent to first-year calculus courses offered by many colleges and is designed for students who have completed four years of mathematics in the advanced studies program. Topics meet the requirements set forth in the syllabus of the College Board. **Students cannot receive credit for both Calculus AB and Calculus BC (MA 3178).**

PREREQUISITE
Mathematical Analysis

REQUIRED STUDENT TEXTBOOK
Calculus, Graphical, Numerical, Algebraic, Fourth Edition, Finney, Demana, Waits, and Kennedy, Pearson/Prentice Hall (2012)

RECOMMENDED CALCULATOR
TI-89 or a similar graphing calculator

Virginia Beach Instructional Objectives
AP Calculus AB – MA3177

VBO #	Objective
	Functions, Graphs, and Limits
MA.APC.1.1	The student will describe the limiting process, calculate limits using algebra, and estimate limits from graphs or tables of data, including one-sided limits.
MA.APC.1.2	The student will analyze graphical behavior to describe asymptotes and asymptotic behavior in terms of limits involving infinity.
MA.APC.1.3	The student will compare relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth).
MA.APC.1.4	The student will explain, in geometric terms, the meaning of continuity of a function and be able to describe continuity in terms of limits.
MA.APC.1.5	The student will describe graphs of continuous functions by applying the Intermediate Value Theorem.
	Derivatives
MA.APC.2.1	The student will describe the concept of a derivative and apply the concept graphically, numerically, and analytically.
MA.APC.2.2	The student will define the relationship between differentiability and continuity.
MA.APC.2.3	The student will define derivatives as the slope of the tangent line to a curve and as instantaneous rate of change using the limit of average rate of change. The student will approximate rate of change from graphs and tables of values.
MA.APC.2.4	The student will analyze the characteristics of the graph of a function and predict the graph of its first derivative and second derivative.
MA.APC.2.5	The student will apply the Mean Value Theorem in order to find the intervals on which a function is increasing and decreasing and compare the behavior of a function and the values of its first derivative.
MA.APC.2.6	The student will translate verbal descriptions into equations involving derivatives and vice versa.
MA.APC.2.7	The student will represent the relationship between the concavity of a function and the values of its second derivative and identify points of inflection.
MA.APC.2.8	The student will use derivatives to analyze functions, including the concepts of monotonicity, concavity, and the intervals on which a function is increasing and decreasing.
MA.APC.2.9	The student will apply the concept of a derivative to solve optimization problems that involve both absolute (global) and relative (local) extrema.
MA.APC.2.10	The student will apply the concept of a derivative to model rates of change, including related rates problems.
MA.APC.2.11	The student will use implicit differentiation to find the derivative of an inverse function.
MA.APC.2.12	The student will interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
MA.APC.2.13	The student will form geometric interpretations of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations.
MA.APC.2.14	The student will compute the derivatives of basic functions, including polynomial and trigonometric.

MA.APC.2.15	The student will compute the derivatives of power, exponential, logarithmic, and inverse trigonometric functions.
MA.APC.2.16	The student will compute the derivatives of sums, products, and quotients of functions and be able to define the general rules for differentiation of sums, products, and quotients of functions.
MA.APC.2.17	The student will compute derivatives of functions using the chain rule and implicit differentiation.
	Integrals
MA.APC.3.1	The student will approximate the area under a non-negative continuous curve using rectangular approximation methods (LRAM, MRAM, and MRAM) and interpret the definite integral as the limit of a Riemann sum.
MA.APC.3.2	The student will use trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.
MA.APC.3.3	The student will interpret the definite integral of the rate of change of a quantity over an interval as the change of the quantity over the interval: $\int_a^b f'(x)\,dx = f(b) - f(a).$
MA.APC.3.4	The student will identify the basic properties of definite integrals (to include additivity and linearity).
MA.APC.3.5	The student will apply integrals to model a variety of physical, biological, or economic situations.
MA.APC.3.6	The student will apply integrals to find the area of a region.
MA.APC.3.7	The student will apply integrals to find the volume of a solid with known cross sections.
MA.APC.3.8	The student will apply integrals to find the average value of a function.
MA.APC.3.9	The student will apply integrals to find the distance traveled by a particle along a line.
MA.APC.3.10	The student will apply integrals to find accumulated change from a rate of change.
MA.APC.3.11	The student will use the Fundamental Theorem of Calculus to evaluate definite integrals.
MA.APC.3.12	The student will use the Fundamental Theorem of Calculus to represent a particular antiderivative and perform a graphical analysis of the functions so defined.
MA.APC.3.13	The student will determine antiderivatives following directly from derivatives of basic functions.
MA.APC.3.14	The student will determine antiderivatives by substitution of variables (including change of limits for definite integrals).
MA.APC.3.15	The student will find specific antiderivatives using initial conditions, including applications to motion along a line.
MA.APC.3.16	The student will solve separable differential equations and use them in modeling (including the study of the equation $y' = ky$ and exponential growth).

VIRGINIA BEACH CITY PUBLIC SCHOOLS
AHEAD OF THE CURVE

MISSION STATEMENT

The Virginia Beach City Public Schools, in partnership with the entire community, will empower every student to become a life-long learner who is a responsible, productive and engaged citizen within the global community.

Dr. James G. Merrill, Superintendent

DEPARTMENT OF CURRICULUM AND INSTRUCTION
2512 George Mason Drive • P.O. Box 6038 • Virginia Beach, Virginia 23456-0038

Virginia Beach City Public Schools does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities and provides equal access to the Boy Scouts and other designated youth groups. School Board policies and supporting regulation (Policies 2-33, 4-4, 5-7, and 6-7 and Regulation 5-44.1) provide equal access to courses, programs, counseling services, physical education and athletics, vocational education, instructional materials, and extracurricular activities. The following staff are designated to handle inquiries regarding the non-discrimination policies: Director of Guidance Services at (757) 263-1980 or to the Assistant Superintendent of Human Resources at (757) 263-1133.

For further information on notice of non-discrimination, visit http://wdcrobcolp01.ed.gov/CFAPPS/OCR/contactus.cfm for the address and phone number of the office that serves your area, or call 1-800-421-3481.

Alternative formats of this publication which may include taped, Braille, or large print materials are available upon request for individuals with disabilities. Call or write The Department of Curriculum and Instruction, Virginia Beach City Public Schools, 2512 George Mason Drive, P.O. Box 6038, Virginia Beach, VA 23456-0038. Telephone (757) 263-1070 or (757) 263-1429; fax (757) 263-1424; TDD (757) 263-1240

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your virtual link to Hampton Roads' largest school system

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