



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, Third Edition, Finney, Demana, Waits, and Kennedy, Pearson/Prentice Hall (2007)

RECOMMENDED CALCULATOR

TI-89 or a similar graphing calculator

Virginia Beach Instructional Objectives

AP Calculus AB – MA3177

AP Calculus BC – MA3178

| School Net Objective | Objective |
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| OBJECTIVES FOR AP CALCULUS AB and AP CALCULUS BC | |
| Functions, Graphs and Limits | |
| MA.C.1.1 | The student will apply the properties of functions, including natural logarithmic, exponential, and trigonometric functions. |
| MA.C.1.2 | The student will state and apply properties of limits, including finding the limit of a constant function, the limit of a sum, a product or a quotient of functions, and use theorems for limits of trigonometric functions. |
| MA.C.1.3 | The student will justify the continuity or discontinuity of a function and recognize and draw a graphical representation of a continuous or discontinuous function. |
| Derivatives | |
| MA.C.2.1 | The student will determine and interpret general derivatives, including writing an equation of a line tangent or normal to a curve at a given point on the curve including parametrically defined curves. |
| MA.C.2.2 | The student will use formulas to find derivatives including polynomial, trigonometric, exponential, logarithmic, and inverse trigonometric functions, and use the chain rule to find derivatives of composite functions. |
| MA.C.2.3 | The student will relate differentiability and continuity. |
| MA.C.2.4 | The student will find higher order derivatives, differentiate implicitly, and find derivatives of parametrically defined functions. |
| MA.C.2.5 | The student will sketch the graph of a function including: determining domain, intercepts, asymptotes, and symmetry; and predicting the graph of the derivative of a function using the graph of the function and vice versa. |
| MA.C.2.6 | The student will solve related rate problems including solving speed, velocity, acceleration, and other rate of change problems. |
| MA.C.2.7 | The student will: solve extreme value problems and justify solutions using the first or second derivatives; determine the antiderivative of a given function; find a linear approximation of a given function; define the differential and interpret the derivative as the quotient of differentials; state and apply the Mean Value Theorem; use differentials to approximate Δy when Δx is small; and use L'Hôpital's Rule for indeterminates. |
| Integrals | |
| MA.C.3.1 | The student will approximate the area under a non-negative continuous curve using LRAM, MRAM, and RRAM, and define the definite integral as the limit of a Riemann sum. |

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| MA.C.3.2 | The student will compute the average value of a function, find the domain of $F(x) = \int_{u(x)}^{v(x)} f(t)dt$, use properties of definite integrals, and approximate definite integrals using the Trapezoidal Rule. |
| MA.C.3.3 | The student will apply the Fundamental Theorem of Calculus (Part 1), the Fundamental Theorem of Calculus (Part 2), and Leibnitz's Theorem. |
| MA.C.3.4 | The student will construct antiderivatives, including using the Fundamental Theorem of Calculus, solving initial value problems, and constructing and interpreting slope fields. |
| MA.C.3.5 | The student will evaluate indefinite and definite integrals by substitution, solve differential equations with variables separable, evaluate indefinite and definite integrals by parts, solve problems involving exponential growth and decay or logistic growth, and use Euler's method to approximate solutions to differential equations given initial values. |
| MA.C.3.6 | The student will integrate rate to find net change. |
| MA.C.3.7 | The student will build a definite integral to compute area between two or more curves, build a definite integral to compute volume, and build a definite integral to calculate length of a curve. |
| OBJECTIVES FOR AP CALCULUS BC ONLY | |
| MA.C.3.8 | The student will use L'Hôpital's Rule for indeterminates. |
| MA.C.3.9 | The student will determine relative growth rates of a function, evaluate improper integrals, determine the convergence or divergence of improper integrals, and evaluate integrals using simple partial fractions. |
| Polynomial Approximations | |
| MA.C.4.1 | The student will apply the properties of geometric series, analyze the truncation error of a series, and determine the convergence or divergence of a series, including absolute or conditional convergence. |
| MA.C.4.2 | The student will use a known power series to generate new power series, find MacLaurin and Taylor series, approximate a function with a Taylor polynomial, and determine the radius and interval of convergence of a power series. |
| MA.C.4.3 | The student will calculate lengths of parametrically defined curves, find the slope of a polar curve at a given point, and compute the area bounded by polar curves. |
| MA.C.4.4 | The student will differentiate and integrate vector-valued functions and analyze the motion of a particle in space given its positions, velocity, or acceleration as a vector function of time. |



VIRGINIA BEACH CITY PUBLIC SCHOOLS

A H E A D O F T H E C U R V E

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.

DEPARTMENT OF CURRICULUM AND INSTRUCTION

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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, Director of Secondary Instructional Services, 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) 263-1412.