AP Calculus BC

Course Description:

http://www.dodea.edu/curriculum/courses/courses_0708/MAC613-6130T.htm

Standards:

http://www.dodea.edu/curriculum/docs/math/stn_math_grd_9_12.pdf

Textbook / Materials:

Student Edition plus AP* Test Prep: Statistics - (Contains: 0-13-368839-9 Student Edition-HS Binder and 0-13-202949-9, AP* Text Prep) - PACK

ISBN Number (Student Edition) 0-13-373132-4

Student Practice Workbook

ISBN Number (Student Edition) 0-13-201411-4

Publisher: Pearson - Prentice Hall & Addison-Wesley

DoDEA Grading Scale:

90-100	=	A
80-89	=	B
70-79	=	C
60-69	=	D
59 or below	=	F

Homework Policy:

Homework will be assigned at the instructor's discretion as appropriate for specific course requirements. Please check the Course Information section in the online course for more specific information.

Late Work Policy:

The DoDEA Virtual High School encourages students to be responsible for their own learning. All assigned work must be received by the teacher in accordance with due dates posted in the online course. Work submitted after the posted due date may not receive full credit. The final deadline for all late work will be set by the individual online teacher. Please check the Course Information section in the online course for more specific information.

Communication:

Students will be expected to interact with the online instructor and classmates in a variety of ways to support instruction. Teacher-student communications are conducted via the following technologies based upon need and availability: phone, email, instant message (IM), and web-conferencing.

DVHS Academic Integrity Policy:

The DoDEA Virtual High School expects all students to abide by ethical academic standards. Academic dishonesty—including plagiarism, cheating or copying the work of another, using technology for illicit purposes, or any unauthorized communication between students for the purpose of gaining advantage during an examination—is strictly prohibited. The DoDEA Virtual High School's Academic Integrity Policy covers all school-related tests, quizzes, reports, class assignments, and projects, both in and out of class.

Topic Outline for AP Calculus

I. Functions, Graphs, and Limits

Analysis of graphs with the aid of technology, graphs of functions are often easy to produce. The emphasis is on the interplay between the geometric and analytic information and on the use of calculus both to predict and to explain the observed local and global behavior of a function.

Limits of functions (including one-sided limits)
• An intuitive understanding of the limiting process
• Calculating limits using algebra
• Estimating limits from graphs or tables of data

Asymptotic and unbounded behavior
• Understanding asymptotes in terms of graphical behavior
• Describing asymptotic behavior in terms of limits involving infinity
• Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth)

Continuity as a property of functions
• An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain.)
• Understanding continuity in terms of limits
• Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)

II. Derivatives

Concept of the derivative
• Derivative presented graphically, numerically, and analytically
• Derivative interpreted as an instantaneous rate of change
• Derivative defined as the limit of the difference quotient
• Relationship between differentiability and continuity

Derivative at a point
• Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.
• Tangent line to a curve at a point and local linear approximation
• Instantaneous rate of change as the limit of average rate of change
• Approximate rate of change from graphs and tables of values

Derivative as a function
• Corresponding characteristics of graphs of ƒ and ƒ_
• Relationship between the increasing and decreasing behavior of ƒ and the sign of ƒ_
• The Mean Value Theorem and its geometric interpretation
• Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.

Second derivatives
• Corresponding characteristics of the graphs of ƒ, ƒ_, and ƒ _
• Relationship between the concavity of ƒ and the sign of ƒ _
• Points of inflection as places where concavity changes

Applications of derivatives
• Analysis of curves, including the notions of monotonicity and concavity
• Optimization, both absolute (global) and relative (local) extrema

• Modeling rates of change, including related rates problems
• Use of implicit differentiation to find the derivative of an inverse function
• Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration
• Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations

Computation of derivatives
• Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions
• Derivative rules for sums, products, and quotients of functions
• Chain rule and implicit differentiation

III. Integrals

Interpretations and properties of definite integrals
• Definite integral as a limit of Riemann sums
• Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:

$$\int_a^b f'(x)\,dx = f(b) - f(a)$$

• Basic properties of definite integrals (examples include additivity and linearity)

Applications of integrals
Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a region, the volume of a solid with known cross sections, the average value of a function, the distance traveled by a particle along a line, and accumulated change from a rate of change.

Fundamental Theorem of Calculus
• Use of the Fundamental Theorem to evaluate definite integrals
• Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined

Techniques of antidifferentiation
• Antiderivatives following directly from derivatives of basic functions
• Antiderivatives by substitution of variables (including change of limits for definite integrals)

Applications of antidifferentiation
• Finding specific antiderivatives using initial conditions, including applications to motion along a line
• Solving separable differential equations and using them in modeling (including the study of the equation y_ = ky and exponential growth)

Numerical approximations to definite integrals
Use of Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values