

Warren County School District
PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: AP Calculus AB

Course Number: 00292

Course Prerequisites: Completion of Pre-Calculus Honors with an average of 85% or Pre-Calculus with a 93% average is recommended.

Course Description:

Advanced Placement Calculus is designed for the student who is interested in a course which furthers his/her fundamental knowledge of calculus. It is designed to introduce and develop fundamental functional behavior of the following topics: differentiation, integration, infinite series, three-dimensional space, vectors, conic sections, polar coordinates, and parametric equations.

Suggested Grade Level: Grades 11-12

Length of Course: ☐ One Semester ☒ Two Semesters ☐ Other (Describe)

Units of Credit: 1 (Insert *None* if appropriate)

PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:
CSPG #50 Mathematics

Certification verified by WCSD Human Resources Department: ☒ Yes ☐ No

TEXTBOOK AND SUPPLEMENTAL MATERIALS

Planned Instruction reflects use of current Board approved textbook? ☐ Yes ☒ No

(If YES, complete the current textbook information below. If NO, complete new textbook information to be approved.)

Board Approved Textbooks, Software, Supplemental Materials:

Title: Advanced Placement Calculus

Publisher: Pearson

ISBN #: 9780133314557

Copyright Date: 2016

Date of WCSD Board Approval:

BOARD APPROVAL:

Date Written: 07/13/15

Date Approved: _____

Implementation Date: 2015-2016

SPECIAL EDUCATION AND GIFTED REQUIREMENTS

The teacher shall make appropriate modification to instruction and assessment based on a student's Individual Education Plan (IEP) or Gifted Individual Education Plan (GIEP).

COURSE OVERVIEW

I. Functions, Graphs, and Limits

A. Analysis of graphs

- With the aid of technology, graphs of functions are often easy to produce.
- To predict and to explain the observed local and global behavior of a function.

B. 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.

C. 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.)

D. Continuity as a property of functions

- An intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)
- Understanding continuity in terms of limits.
- Geometric understanding of graphs of continuous functions. (Intermediate Value Theorem and Extreme Value Theorem)

II. Derivatives

A. Concept of the derivative

- Derivative presented geometrically, 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.

B. 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.

C. Derivative as a function

- Corresponding characteristics of graphs of f and f' .
- Relationship between the increasing and decreasing behavior of f and the sign of f' .
- The Mean Value Theorem and its geometric consequences.
- Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.

D. Second derivatives

- Corresponding characteristics of the graphs of f , f' , and f'' .
- Relationship between the concavity of f and the sign of f'' .
- Points of inflection as places where concavity changes.

E. 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.

F. Computation of derivatives

- Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
- Basic rules for the derivative of sums, product, and quotients of functions;
- Chain rule and implicit differentiation.

III. Integrals

A. Interpretations and properties of definite integrals

- Computation of Riemann sums using left, right, and midpoint evaluation points.
- Definite integral as a limit of Riemann sums over equal subdivisions.
- Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:

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

- Basic properties of definite integrals. (Examples include additivity and linearity.)

B. Applications of integrals

- Appropriate integrals are used in a variety of applications to model physical, social, or economic situations.
- Students should be able to adapt their knowledge and techniques to solve other similar application problems.
- Using the integral of a rate of change to give accumulated change or using the method of setting up an approximating Riemann sum and representing its limit as a definite integral.
- Finding the area of a region, the volume of a solid with known cross sections, the average value of a function, distance traveled by a particle along a line.

C. 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.

D. Techniques of antidifferentiation (optional topic)

- Antiderivatives following directly from derivatives of basic functions.
- Antiderivatives by substitution of variables (including change of limits for definite integrals).

E. Applications of antidifferentiation (optional topic)

- Finding specific antiderivatives using initial conditions, including applications to motion along a line.

- Solving separable differential equations and using them in modeling. In particular, studying the equation $y' = ky$ and exponential growth.
- F. Numerical approximations to definite integrals (optional topic)
- Use of Riemann and trapezoidal sums to approximate definite integrals of functions represented algebraically, geometrically, and by tables of values.

For standards, essential questions, content, and skills see Curriculum Map – [Click here to enter text.](#)

ASSESSMENT

Portfolio Assessment: _____ Yes ☒ No

District-Wide Common Final Examination Required: ☒ Yes _____ No

Course Challenge Assessment (Describe): Course challenge assessment will be based on activities and exams that measure student proficiency of the course standards at 84%.

WRITING TEAM: Warren County School District Teachers

WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination? ☒ Yes _____ No
**Warren County School District Policy 9741 and 9744 state, "All classes in grades 9-12 shall have a final exam."*
2. Does this course issue a mark/grade for the report card? ☒ Yes _____ No
3. Does this course issue a Pass/Fail mark? _____ Yes ☒ No
4. Is the course mark/grade part of the GPA calculation? ☒ Yes _____ No
5. Is the course eligible for Honor Roll calculation? ☒ Yes _____ No
6. What is the academic weight of the course?
 _____ No weight/Non credit _____ Standard weight ☒ Enhanced weight