



**KENOSHA UNIFIED SCHOOL DISTRICT NO. 1  
CURRICULUM AND INSTRUCTIONAL SERVICES**

**HIGH SCHOOL COURSE SYLLABUS**

**MATHEMATICS**

**Advanced Placement Calculus BC (354031, 354032, 354033, 354034)**

**Number of Credits: 2**

**Prerequisites**

Pre-Calculus Honors (352021 and 352022) or equivalent with grade of “B” or better or teacher recommendation

**Course Description**

This course is equivalent to a full-year college course in single variable calculus. It follows the College Board Advanced Placement Calculus BC course outline. It covers functions including parametric, polar, and vector representations, use of graphs, derivatives and their applications, differentials, limits, integrals and their applications, differential equations, and infinite series. The course emphasizes a multirepresentational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally, with the connections among these representations highlighted. It is strongly recommended that students who successfully complete this class take the AP Calculus examination in the spring, which could result in earning college credit.

**Relevance**

Calculus ties together all of the mathematical skills learned in Algebra and Geometry and proves many of the theorems and formulas that were discovered and used in these previous courses. Calculus prepares students for many careers and is a requirement for several major areas of study.

**Course Standards**

A. Mathematical Processes                      C. Geometry                      E. Statistics and Probability  
B. Number Relationships                      D. Measurement                      F. Algebraic Relationships

Most essential benchmarks may be viewed at: [www.kusd.edu](http://www.kusd.edu).

**Lifelong Learning Standards**

- Knowledgeable person
- Effective communicator
- Quality producer
- Complex thinker
- Self-directed learner
- Contributing citizen

Lifelong learning benchmarks may be viewed at: [www.kusd.edu](http://www.kusd.edu).

## **Course Outline**

### **FIRST QUARTER:**

#### **Chapter 1: Limits and Their Properties (6 days - 1 test)**

- Graphical and numerical limits
- Analytical limits
- Continuity
- Infinite limits and limits at infinity

#### **Chapter 2: Differentiation (11 days – 1 test)**

- Derivatives and tangent lines
- Differentiation rules and rates of change
- Products and quotients
- Chain rule
- Implicit differentiation
- Related rates

#### **Chapter 3: Applications of Differentiation (12 days – 1 test)**

- Extrema
- Extrema with graphing calculators
- Rolle's Theorem and the Mean Value Theorem
- Increasing and decreasing functions
- Concavity
- Curve sketching
- Optimization
- Newton's Method
- Differentials

#### **Chapter 4: Integration (11 days – 1 test)**

- Antiderivatives and indefinite integration
- Riemann sums and definite integrals
- Fundamental theorem of calculus
- Integration by substitution
- Numerical integration

### **SECOND QUARTER:**

#### **Chapter 5: Logarithmic, Exponential, and Other Transcendental Functions (10 days – 1 test)**

- Natural Logarithmic differentiation
- Natural Logarithmic integration
- Inverse functions
- Exponential functions
- Other exponentials and logarithms
- Inverse functions and inverse trigonometric derivatives

**Chapter 6: Differential Equations (5 days – 1 test)**

- Slopefields
- Differential equations
- Euler’s Method for numerical approximation of a differential equation
- Separation of variables
- Solving logistic differential equations and using them in modeling

**Chapter 7: Applications of Integration (13 days – 1 test)**

- Area between curves
- Disks
- Washers
- Shells
- Known cross-sections
- Arc length and surface area
- Work
- Moments, centers of mass, and centroids
- Fluid pressure and fluid force

**Chapter 8: Integration Techniques, L’Hôpital’s Rule, and Improper Integrals (13 days – 1 test)**

- Review of basic integration rules
- Integration by parts
- Trigonometric integrals
- L’Hôpital’s Rule
- Improper integrals

**THIRD QUARTER:**

**Chapter 9: Infinite Series (22 days – 1 test)**

- Sequences
- Series and convergence
- The integral test and p-series
- Comparison of series
- Alternating series
- The Ratio and Root tests
- Taylor polynomials and approximations
- Power Series
- Representations of functions by power series
- Taylor and Maclaurin series
- Infinite series

**Chapter 10: Plane Curves, Parametric Equations, and Polar Curves (12 days – 1 test)**

- Plane curves and parametric equations
- Parametric equations and calculus
- Conics and calculus
- Polar coordinates and polar graphs
- Area in polar coordinates
- Polar equations of conics and Kepler’s Laws

### **Chapter 11: Vectors and the Geometry of Space (1 day)**

- **Vectors in the plane**
- **Vectors in space**

### **Chapter 12: Vector-Valued Functions (2 days)**

- **Vector-Valued Functions**
- **Differentiation and Integration of Vector-Valued Functions**
- **Position, Velocity, and Acceleration**

### **FOURTH QUARTER:**

- Intensive AP Exam preparation
- Additional projects

### **AP REVIEW**

All tests are in the format of the AP exam: containing multiple choice and free response sections. Justification of methods and answers are expected on most free response items. Tests are designed to be representative of the AP exam so that students will feel comfortable taking the AP Exam at the end of the course. Full-length practice exams will be conducted outside of class and then used to prepare for the rigors of the exam. The class days in fourth quarter are allotted for review prior to the AP exam. This review will be group oriented. Students will share ideas and generate collaborative responses. The focus will be on using sound calculus techniques and justifying solutions with well-written responses that explain the underlying calculus. Responses will be critiqued using the AP scoring guides.

### **Board-Approved Instructional Materials**

Larson, Hostetler, et al., Calculus, McDougal Littell, 2006, 8th edition (ISBN 0-618-50304-8)

Online Resources: [www.CalcChat.com](http://www.CalcChat.com)

[http://college.cengage.com/mathematics/larson/calculus\\_analytic/8e/student\\_home.html](http://college.cengage.com/mathematics/larson/calculus_analytic/8e/student_home.html)

### **Supplementary Materials**

Graphing calculator. AP calculus students are expected to investigate concepts analytically, graphically, and numerically. Students will be expected to use their calculator to graph a function in an arbitrary window, to find roots and points of intersection, to approximate numerical derivatives, and to approximate definite integrals. Calculators will also be used to explore mathematical ideas such as limits and local linearity and to interpret and verify results that have been found symbolically. Students will also be expected to relate the various representations to each other and the instructor either verbally or in writing. A TI-83 or TI-84 will be available during class and will be used by the instructor for demonstration purposes. A calculator of this type would be sufficient. The important thing is that **you** know how to utilize the model of your choice to perform the operations described above.

## **Methods of Assessment**

Final exams should be cumulative in nature, emphasizing the most essential benchmarks for the course. Results of the final exam represent 20 percent of the final grade, but this single measure *may not* drop a student's grade by more than one letter grade. In courses that rely heavily on a major project, performance exhibition, etc., the project should be divided into stages or components and each of those should be graded separately, providing students with frequent and specific feedback.

## **Board-Approved Grading Scale**

Excerpts taken from School Board Rule 6452

### GRADING SCALE

A+=98-100 percent	B+=86-89 percent	C+=76-79 percent	D+=66-69 percent
A=93-97 percent	B=83-85 percent	C=73-75 percent	D=63-65 percent
A-=90-92 percent	B-=80-82 percent	C-=70-72 percent	D-=60-62 percent
			F=0-59 percent

### MAKE-UP WORK

Students submitting work up to ten school days late without prior approval may receive up to two grades lower on the work than they would have received if the work had been submitted on time (i.e., B+ lowered to A D+). Student work submitted after ten school days without prior approval shall not be accepted for credit and shall be recorded with a score of zero.

Upon returning to school after an absence, a student has the responsibility within the number of days equal to the length of the absence or suspension to meet with the teacher to develop a plan for making up missed work, quizzes, and examinations. A truant student has the responsibility on the first day he or she returns to the course/class to meet with the teacher to develop a plan for making up missed work, quizzes, and examinations. Lower grades may not be given for late work due to excused absences, suspension, or truancy unless the work is submitted later than agreed upon deadlines.

**See Rule 6452 in its entirety at: [www.kusd.edu](http://www.kusd.edu).**