AP Calculus

Course Information:

Teacher: Mr Burkowski
Email: lburkowski@bc.k12.mi.us
Textbook: Smith, Minton. *Calculus Early Transcendental Functions*, 3rd Ed. McGraw Hill, 2007
Conference hour:
Phone: 810-346-4700
Weekly tutorial session: Every Wednesday after school from 3:15 until 4:15

Course Objectives and Philosophy

The class is taught over the entire academic year and will be comparable to a calculus I course taught in a college or university setting.

This course is intended to prepare students for college math courses. Students are expected to complete college level work and to be self directed in their learning. Students must come to class each day prepared to discuss concepts learned as well as those for which they need clarification. Understanding of key concepts will be expressed graphically, algebraically, in sentence form, and orally. Students will use technology to help them solve problems, determine and anticipate the reasonableness of their solutions, and to verify their answers. **Students will learn how to use graphing calculators (TI-83 plus or better) as a problem solving tool and as a tool to inductively discover calculus concepts and ideas. Students will use calculators on a daily basis to explore, discover, and expand upon calculus concepts.** The course will focus on problems with real life application as well as those needed for a theoretical understanding. Concepts will be taught using graphical, numerical, analytical, and verbal strategies. Students will learn to depend not just on the teacher but also on text books, the internet, and peers to overcome the challenges of this course.

Students are encouraged to work in groups in class and outside of class. Students will regularly share their solutions and strategies on the board or in front of the class. This gives the students an opportunity to view alternative solution methods and to communicate the process they used with the rest of the class.

Students will be assigned homework 3 – 4 times a week. Most homework assignments are graded on completion and corrected by the students. Students are encouraged to work cooperatively on assignments to maximize learning. To effectively gauge progress and growth, students take short timed quizzes weekly and take tests after the completion of each unit. Because the AP exam allows the use of a calculator on only a portion of the exam, a portion of each test will be completed without the use of a calculator. All exams contain AP Style questions from both the free response and the multiple choice sections of the AP exam.

There is a weekly tutorial session for every Wednesday after school from 3:15 until 4:15 that is reserved for only the AP calculus students. Help is also available before or after school on most days but students are encouraged to attend the Wednesday help session whenever possible.

Technology Requirements:

A graphing calculator (TI-84 plus silver edition) will be provided for use in the classroom. It is recommended that each student have a graphing calculator available for home use. Which calculator is used outside of the classroom is up to each student individually. However, when considering what calculator to purchase it would be wise to contact the college or university you are planning to attend and use the information they share with you as a guide. A graphing calculator may also be available for checkout and home use if needed.

Course Timeline:

1st semester

Week 1 Review worksheets covering slope, finding an equation for a line, trigonometry, factoring, interval notation, piecewise linear functions, and rules for exponents. More review will be done as needed throughout the year.

Weeks 2-4 Limits and Continuity.

Limits of functions including one sided limits, understanding the limiting process, calculating limits using algebra and estimating limits using graphs and tables. End behavior including asymptotes and unbound function. Continuity of functions including an intuitive understanding and formal understanding in terms of limits using graphs, as well as analytic and numerical methods. (chapter 1) test 1

Weeks 5-8 Derivatives

A history of calculus and the tangent line problem. Formal definition of a tangent line. Derivatives of functions using the power rule, product rule, and quotient rule. Derivatives of trigotrometric functions. Linear approximation in relation to tangent lines, slope in algebra vs slope in calculus. Rate of change in relation to distance, velocity and acceleration. The difference between instantaneous and average velocity. Other real life interpretations of derivatives. Dy/dx notation for derivative as well as graphical, numerical, verbal and analytical understanding of derivative.(chapter 2) test 2

Weeks 9-10 Derivatives: chain rule and implicate differentiation. (chapter 2) test 3

Week 11 Related Rates with emphasis on word problems. (chapter 3) test 4

Weeks 12-16 Curve sketching and optimization

Using the mean value theorem and its relation to geometry. Finding critical numbers, increasing and decreasing slope, and the corresponding characteristics of graphs of f and f' to f''. Relative and absolute extrema and their relation to critical numbers. Second derivative and points of inflection as a place where concavity changes. Translation between verbal and written equations involving derivatives. Real life application of these terms. Optimization word problems. (chapter 3) test 5

Week 17 Midterm Exam

2nd semester

Weeks 1-2 Antiderivative:

Antiderivative as related to derivatives of basic functions. Finding antiderivative by substitution. Applications of antidifferentiation including finding specific antiderivatives using initial conditions, including applications to motion along a line. Using slope to understand the relationship between derivatives and antiderivatives. (chapter 4) test 6

Weeks 3-4 Integrals

Definition of derivatives as a limit of Riemann sums, using Riemann sums (left, right, and midpoint) to approximate definite integrals algebraically, graphically, and using tables. Fundamental Theorem of Calculus parts 1 and 2 to evaluate definite integrals and to analyze functional behavior. Integrals as accumulator of rates of change and its applications to chemistry, statistics, physics, and other fields. Base properties of definite integrals such as additively and linearity. (chapter 4) test 7

Weeks 5-6 Integrals

Trapezoidal approximation to approximate definite integrals. Integration by substitution including change of limits for definite integrals. (chapter 4) test 8

Weeks 7-10 Exponential and logarithmic functions

Exponential and logarithmic functions including decay and growth, inverse functions, e using the fundamental theorems of calculus (both parts 1 and 2). Derivatives and integrals of logarithmic and exponential functions for base e and bases other than e. (chapter 5) test 9

Weeks 11-13 Area and volume

Area and volume between 2 curves. Volumes of revolution by disk and washer method. Volumes of cross sections. (chapter 6)

Weeks 14-17 AP review

AP EXAM

Grade Scale

93% to 100%	**A**
88% to 92%	**A-**
84% to 87%	**B+**
81% to 83%	**B**
78% to 80%	**B-**
74% to 77%	**C+**
71% to 73%	**C**
68% to 70%	**C-**
64% to 67%	**D+**
61% to 63%	**D**
56% to 60%	**D-**
less than 56%	**E**

Grading Criteria

Homework/projects 20%
Quizzes 20%
Tests 60%