Course Rationale: AP Calculus AB is a college level introductory Calculus class. Students taking the course are expected to take the AP Examination at the end of the academic year. The course emphasizes a multi-representational approach to calculus with concepts, results, and problems expressed graphically, numerically, analytically, and verbally. The course teaches students how to communicate mathematics and explain solutions to problems both verbally and in sentences. Students will explore and apply the conceptual underpinnings of Calculus by examining the concept of the limit. Applications of limits such as the average rate of change in various disciplines will be addressed. In addition, the concept of limit will be extended to the idea of the derivative and integral in multiple representations and with applications to various disciplines.

Pre-requisite Skills and Knowledge:
Students have completed four years of secondary mathematics designed for college-bound students including algebra, geometry, trigonometry, analytic geometry, and elementary functions. In particular, before studying calculus, students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, and so on) and know the values of the trigonometric functions of the numbers 0, \( \frac{\pi}{6} \), \( \frac{\pi}{4} \), \( \frac{\pi}{3} \), \( \frac{\pi}{2} \), and their multiples. District Courses satisfying these requirements are Algebra 1 and 2, Formal Geometry 1 and 2, Intermediate Algebra 1 and 2, and Math Analysis 1 and 2.

Texts and Materials:

Student Expectations/Citizenship (Participation):
Students are expected to be active participants and make a positive contribution to the atmosphere and work of the classroom. They are also expected to keep a notebook with notes, complete assignments on time, be prompt to class prepared to learn, and follow classroom rules.

Homework Policy:
Homework will be given daily. Homework will be scored based upon on accuracy and completion.

Assessments:
Short quizzes and mid-unit assessments will serve as “informative” assessments throughout each unit. Summative assessments (Unit Exams) will include constructed response, multiple-choice and on-demand writing questions. The End Of Course exam will be multiple-choice questions with and without a graphing calculator, and constructed responses.

Mastery Model
One unit summative assessment per semester may be retaken to improve letter grade. The final exam for semester 2 is a mock AP exam that is 4 hours in length and given on a Saturday. The teacher will provide more detail.
Gradning Policy:
Students’ grades will be calculated from their scores on work in the following areas: 80% Summative Assessment (End-Of-Course Exam, unit tests, mid-unit tests and projects), 10% Homework and 10% class work. Letter grades (A to F) will be assigned on a modified AP Scale to indicate student progress towards mastery of learning objectives and district/state standards. **End Of Course (EOC) exams will count as 20% of the semester grade.**

The modified AP grading scale is as follows:

| 87-100% | A | 66-71% | C |
| 84-87%  | A- | 62-65% | C- |
| 80-83%  | B+ | 60-61% | D+ |
| 76-79%  | B  | 54-59% | D  |
| 74-75%  | B- | 51-53% | D- |
| 72-73%  | C+ | 50% and Below | F |

Course Schedule:
Detailed assignment sheets will be provided at the start of each unit.

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Course Outline:
This course addresses the content specified by the College Board for AP Calculus AB.

Chapter 1: Students will
- review graphing skills, including finding intercepts and determining symmetry.
- review function notation, domain and range, and graphs of common functions and their transformations.
- determine limits graphically, numerically, and algebraically.
- determine continuity of a function and one-sided limits.
- evaluate infinite limits.

Text Resource: Calculus text sections P.1, P.3, 1.1, 1.2, 1.3, 1.4, 1.5, 3.5

Chapter 2: Students will
- differentiate from first principles; that is, use and understand the limit definition of the derivative.
- differentiate various functions using rules of differentiation, including product rule, quotient rule, and chain rule.
- apply differentiation to a variety of problems, including finding equations for tangent and normal lines, and calculating velocity of a moving object.
- use implicit differentiation to find dy/dx, and apply implicit differentiation to related rates problems.

Text Resource: Calculus text sections 2.1-2.6

Chapter 3: Students will
- locate extrema of functions on a given interval.
- identify and apply Rolle’s Theorem and the Mean Value Theorem.
- determine intervals where functions are increasing and decreasing.
- determine intervals where functions are concave up and concave down, and locate points of inflection.
- use the above techniques to sketch many types of functions, including polynomials, rational, radical, and trigonometric.
- solve applied minimum and maximum problems (optimization).
- use linear approximations and differentials to approximate function values and/or error in measurement.

Text Resource: Calculus text sections 3.1-3.4, 3.6, 3.7, 3.9

Chapter 4: Students will
- determine simple integrals through the process of antidifferentiation.
- solve simple differential equations, including finding the particular solution given initial conditions.
- apply the Mean Value Theorem as it relates to integrals.
- determine areas bounded by curves through the use of geometry formulas, various approximation methods, and integration.
- use the Second Fundamental Theorem of Calculus to evaluate integrals, and derivatives of integrals.
- evaluate more complex integrals through the process of substitution.

Text Resource: Calculus text sections 4.1-4.6
Chapter 5: Students will
- demonstrate how to graph, interpret, use properties of, and differentiate the natural logarithm function.
- apply the process of logarithmic differentiation to simplify problems.
- integrate functions of the form \( \int \frac{1}{t} \, dt \).
- define and find inverse functions, and apply the relationship between a function and its inverse in finding derivatives.
- graph, interpret, use properties of, differentiate, and integrate the exponential function.
- apply their knowledge of the natural logarithm and natural exponential function to other bases, including the calculus of these functions.
- solve separable differential equations, specifically those arising from situations of growth and decay.
- apply solutions to differential equations to problems involving compound interest and exponential growth and decay.
- use integration and differentiation to solve problems involving inverse trigonometric functions.

Text Resources: Calculus text sections 5.1-5.9

Chapter 6 and 7: Students will
- find the area of the region bounded by two curves.
- compute volumes of solids of revolution using disc, washer, and shell methods.
- compute volumes of solids with known cross sections.
- evaluate integrals using a variety of techniques.
- determine limits with indeterminate forms.

Text Resource: Calculus text sections 6.1-6.3, 7.1, 7.7