Course Name: AP Calculus AB

Duration: ☐ 1 Semester ☒ Full Year

Grade Level: ☒ 9th ☒ 10th ☒ 11th ☒ 12th (check all that apply)

Are there any prerequisites for the course?

Passing grade in both semesters of Precalculus REQUIRED.

WHAT this course is about:

This class covers one semester (two quarters) of college Calculus.

Calculus AB is concerned with developing the students' understanding of the concepts of calculus and providing experience with its methods and applications. The courses emphasize a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The connections among these representations also are important.

Broad concepts and widely applicable methods are emphasized. The focus of the courses is neither manipulation nor memorization of a list of functions, curves, theorems, or problem types. Although problems with manipulation and computational competence are important they are not the core of the course.

Technology will be used regularly to reinforce the relationships among the multiple representations of functions, to confirm written work, to experiment, and to assist in interpreting results.

Through the use of the unifying themes of derivatives, integrals, limits, approximation, and applications and modeling, the course becomes a cohesive whole rather than a collection of unrelated topics.

WHY take this course:

Take this course if you are wanting to challenge yourself in mathematics or are planning on studying Science, Engineering, or Mathematics in college.

WHAT you'll learn:

Limits: Students must have a solid, intuitive understanding of limits and be able to compute one-sided limits, limits at infinity, the limit of a sequence, and infinite limits. They should be able to apply limits to understand the behavior of a function near a point and understand how limits are used to determine continuity.

Derivatives: Students should be able to use different definitions of the derivative, estimate derivatives from tables, and graphs, and apply various derivative rules and properties. Students should also be able to solve separable differential equations, understand and be able to apply the

Mean Value Theorem, and be familiar with a variety of real-world applications, including related rates, optimization, and growth and decay models.

Integrals and Fundamental Theorem of Calculus: Students should be familiar with basic techniques of integration, including basic antiderivatives and substitution, and properties of integrals. Students should also understand area, volume, and motion applications of integrals, as well as the use of the definite integral as an accumulation function. It is critical that students understand the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus.

WHAT you'll do:

You will learn to connect multiple representations of concepts expressed graphically, numerically, analytically, and verbally. The connections between these representations are important.

You will learn to communicate mathematically. Not only to solve a problem but to properly justify your answer.

WHERE this could take you:

With a score of 3 or better on the AP Calculus AB test you could earn up to 1 semester (2 quarters) of credit for calculus at many universities.

Most Business, Science, Technology, Engineering, and Mathematics majors require at least one semester of college calculus. This class could satisfy this requirement while still in High School.

OPTIONAL Course Outline ("scope and sequence", sequence chart, etc.)

I. Semester 1
   a. Limits & Derivatives
      i. Limits – Algebraically, Numerically, Graphically
      ii. Continuity
      iii. Definition of a Derivative
      iv. Basic Derivative Properties – Power, Product, Quotient, Sums & Differences
      v. Differentiability
      vi. Chain Rule
      vii. Implicit Differentiation
      viii. Related Rates
      ix. L'Hospital's Rule
      x. Inverse Derivatives
   b. Graph Analysis aka "The Calc House"
      i. MVT
      ii. EVT
      iii. Calc House with Polynomials
      iv. Optimization
      v. Motion along a Line - Derivatives

II. Semester 2
   a. Integrals

i. Reimann Sums
ii. Evaluating Definite Integrals – $F(b) - F(a)$
iii. Fundamental Theorem of Calculus (FTC)
iv. Integration by Substitution (U-Substitution)
v. Integration by Parts
vi. Integration by Partial Fractions

b. Differential Equations
   i. Slope Fields
   ii. Differential Equations
   iii. Euler's Method
   iv. Exponential and Logistic Growth

c. Integration Applications
   i. Area between 2 Curves
   ii. Volume of Cross Sections
   iii. Volume of Revolutions – Washer & Disk
   iv. Motion along a line - Integrals

AP Review

Post Calculus Project