Pilot Course Proposal

Submitted by: WillieAnn Donahue Building: LHS

Proposed Course Title: AP calculus AB, CWU College in the High School Calculus I

Grade Level: Any Department: Math

PLEASE ATTACH THE FOLLOWING:

Description of course content and how this course will meet current needs not being met by other courses. Description must also include the needs assessment data.

- Specifically, what will the student know and be able to do as a result of this course?

AP Calculus AB is an introductory college-level calculus course. Students cultivate their understanding of differential and integral calculus through engaging with real-world problems represented graphically, numerically, analytically, and verbally and using definitions and theorems to build arguments and justify conclusions as they explore concepts like change, limits, and the analysis of functions.

Performance Skills

Upon successful completion of this course, the student will be able to:

- Determine limits and continuity
- Determine the derivatives of algebraic functions using the definition of the derivative and other fundamental properties
- Determine the derivatives of functions, Composite, Implicit, and Inverse Functions
- Use the concept of the derivative to determine the properties of functions
- Model situations using the derivative function and contextual Applicaitons
- Use the first and second derivatives of a function to determine maxima and minima of a function
- Understand the relationship between the derivative of a function and the function's graphical representation.
- Use the process of antidifferentiation to solve problems.
- Use of Integration of an Accumulation of Change
- Demonstrate an understanding of the definition of a definite integral.
- Use the Fundamental Theorem of Calculus to solve problems.
- Compute antiderivatives using basic antidifferentiation rules, u-substitution, inverses and other properties
- Set up definite integrals to represent quantities that are given in context and integrate.
- Relate the techniques of integration to the solution of differential equations.

In addition to the topics determined by College Board, there are additional topics that will need to be taught throughout the term for students to have success on the CWU final which is 20% of their grade.

Additional topics include:

- Newton's Method of Approximation
- Epsilon/Delta Proofs
- Logarithmic differentiation
- Other topics that will be provided at the training

Technology Skills

Students will be able to

- Use a graphing calculator to extract numerical information regarding functions: function/expression values, roots/intercepts, maxima/minima, and points of intersection, integrals, derivatives, and analyzing the various function, derivative and 2nd derivative graphs.

Upon completion of this course students will be able to meet the following Washington State _____K-12 Learning Standards:

AP calculus is above the Washington state standards. The standards are developed by the college board in conjunction with college professors and calculus teachers nation-wide. CWU standards were adopted by Central Washington University in 2007.

There are some Washington State standards that are discussed in calculus. However, the topics in the state standards are algebra based not calculus based.

- **Standard 5:** Interpreting Functions F-IF
  Interpret functions that arise in applications in terms of the context
  - 4. HSF-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities Key features include: intercepts; intervals where the function is increasing, decreasing; relative maximums and minimums; end behavior (using calculus techniques not algebraic as in the state standards). ★
  - 6. HSF-IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph (as it is applied to the Mean Value Theorem (a calculus principle above the state standards)).★
- ***Standard 6:*** *Building functions F-BF*
  - Building new functions from given functions (using calculus which is above the state standards)

- **What are the assessments that will be used to determine student achievement of the goals of this course?**
  - In addition to regular tests and quizzes throughout the trimesters. Students will be assessed using the CWU Math 171 final exam (20% of their grade as required by CWU). Upon completion of this course students will also be prepared for the AP calculus, AB test.

Describe how this course will address:

- **Alignment with Common Core State Standards (CCSS) and/or WA State Essential Academic Learning Requirements (EALRs)**

Students will be able to:

- Implement Mathematical Processes by determine expressions and values using mathematical processes
- Connect representations through translating mathematical information from a single representation
- Justify reasoning and solutions using theorems and definitions of calculus
- Communicate and notate using correct notation and mathematical language and conventions.
- Work cooperative with others

- **Infusion of diversity/multicultural perspectives** – Yes, the history of mathematical theorems are discussed as new calculus topics are introduced.

- **Integration with other subject areas** – Yes, calculus based physics is discussed throughout the course.
- **Provision of appropriate experiences for learners of varying abilities** – Yes. However, in order to take the college credit bearing class, a student must either "test into the class with a pre-determined score by CWU or pass CWU Math 151 and 152 with a C or higher. Otherwise, the only way for a student to earn college credit is through the AP test.
- **Development of higher level thinking and processing skills** - Yes
- **Articulation of scope and sequences across grades K-12. Will this course replace an existing curriculum? If so, which course?**

AP calculus AB, CWU College in the High School Calculus I will replace AP Calculus AB. It is important the title still includes the AP calculus in the title as the frame work for the class is AP calculus AB, not CWU Calculus I. Calculus I topics for Central are in addition to the original calculus course.

Current Scope and Sequence

The Scope and sequence of this class will follow the score and sequence of AP calculus AB with additional topics placed before integration and integration techniques. The final for CWU will be given before moving to integration and integration techniques before the end of 2nd trimester.

- Statement of impact:
  - In addition to preparing and learning the information for the AP calculus exam (which could provide college credit if a student earns a score of 3 or higher at most universities), the course could provide an additional opportunity to receive the same college credit through CWU that passing the AP test will provide.

- Instructional materials and cost (include titles, names of publishers and copyright).

  Materials will be the same as current AP calculus materials in addition to additional topics required by the college (but not part of the AP curriculum). Extra materials will be needed, not sure of the costs until completing the orientation by CWU.

SIGN-OFF FOR PILOT COURSE RECOMMENDATION

	Signature / Date
1. Department Head (Secondary) **Accepts** ☒ **Rejects** ☐	5/9/24
2. Principal **Accepts** ☒ **Rejects** ☐	05/09/24
3. District Content Facilitator **Accepts** ☐ **Rejects** ☐	
4. Curriculum Director **Accepts** ☐ **Rejects** ☐	

Return original to the Director of Curriculum and Instruction. Copies to Principal and Course Originator.