Advanced Placement Calculus AB

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Hazelwood School District

Mission Statement

We are a collaborative learning community guided by a relentless focus to ensure each student achieves maximum growth.

Vision Statement

HSD will foster lifelong learners, productive citizens and responsible leaders for an ever-evolving society.

Board of Education on January 5, 2010

Goals

Goal #1: Hazelwood students will meet or exceed state standards in all curricular areas with emphasis in reading, writing, mathematics, science and social studies.

Goal #2: Hazelwood staff will acquire and apply skills necessary for improving student achievement.

Goal #3: Hazelwood School District, the community and all families will support the learning of all children.

Curriculum Overview

The HSD AP Calculus curriculum has not been updated in more than 7 years. Since that time, mathematics standards, learning progressions and best practices informed by research has drastically changed. This rewrite is to comply with MSIP V and to help ensure that all HSD students are receiving a high quality mathematics education

This course emphasizes a multi-representational approach to calculus with concepts, results, and problems being expressed geometrically, numerically, analytically, and verbally. The connections among these representations are made through the study of derivatives, integrals, limits, approximation, application, and modeling. Technology will be used regularly by students and teachers to reinforce the relationships among the multiple representations of functions to confirm written work, to implement experimentation, and to assist in interpreting results.

AP Calculus will be a rigorous course, preparing all of its students for the Advanced Placement Calculus test. This course will be taught at a quicker pace since students must master all of these objectives before the AP test is administered in May. Optional objectives can be taught after the AP test. A culminating project or application problems will be completed by the students at the end of the course. In addition to the quicker pace, homework assignments will include additional challenging problems. Alternative assessments such as projects or experiments will be more frequent and require more detail and work outside the classroom.

The curriculum contains unit assessments that are rigorous and outline clear expectations. As the curriculum is implemented and taught, the assessments will be revised. **The assessments are required**; the learning activities are suggested. Teachers are encouraged to select the learning activities which meet the needs of their students. Some of the learning activities are very sequential and, when all of them are used, a student should be able to successfully complete the unit assessment. Other activities provide a menu of suggestions, and the teacher should select from those offered or design his/her own.

The Hazelwood School District offers calculus for students who wish to challenge themselves with an intensive college-level curriculum. The course is rigorous in its pacing and the amount of material studied, preparing students to continue and succeed in their studies of calculus at the collegiate level. Students often choose to take Advanced Placement Calculus in order to take the Advanced Placement Calculus AB exam.

The plan for professional development includes multiple opportunities for training to help ensure that the high school mathematics curricula are implemented effectively and with fidelity. Initial training will be provided during district professional development opportunities to cover content and pedagogy. In addition to professional development days, ongoing training will be provided during Professional Learning Community (PLC) meetings to assist with upcoming skills and nuances in learning objectives. The Mathematics District Curriculum Coach and District Coordinator will provide teachers training to familiarize them with curriculum activities and expectations. Finally, ongoing training during PLC meetings will assist teachers with upcoming skills and with nuances in the learning objectives.

COURSE TITLE: Advanced Placement Calculus AB

GRADE LEVEL: 11th & 12th Grade

CONTENT AREA: Mathematics

Course Description:

AP Calculus will be a rigorous course, preparing all students for the Advanced Placement Calculus test. Several advanced concepts will be taught in addition to the objectives listed in the regular calculus curriculum. This course will be taught at a quicker pace since students must master all of these objectives before the AP test is administered in May. In addition, homework assignments will include AP test preparation problems. Alternative assessments such as projects or experiments will be more frequent and require more detail and work outside the classroom.

Course Rationale:

We live in a mathematical world. The Hazelwood School District offers calculus for students who wish to challenge themselves with an intensive college-level curriculum. Students learn how to communicate mathematically on an advanced level and how to apply much of their previous math experience to the real world. Students often choose to take Advanced Placement Calculus in order to take the Advanced Placement Calculus AB exam   Earning a score of 3 or better on the Advanced Placement text allows students to receive credit and advanced placement into Calculus II at most universities or colleges nationwide.

Course Scope and Sequence		
Unit 1: Functions, Graphs, and Limits (Approx. 27 class periods)	Unit 2: Derivatives (Approx. 37 class periods)	Unit 3: Integrals and the Fundamental Theorem of Calculus (Approx. 30 class periods)

Unit Objectives

Unit 1: Functions, Graphs, and Limits
1. Understand the concept of a function and use function notation.
2. **The** concept of a limit can be used to understand the behavior of functions.
3. **Continuity** is a key property of functions that is defined using limits.

Unit 2: Derivatives
1. **The** derivative of a function is defined as the limit of a difference quotient and can be determined using a variety of strategies.
2. **A** function's derivative, which is itself a function, can be used to understand the behavior of the function.
3. The derivative has multiple interpretations and applications including those that involve instantaneous rates of change.
4. **The** Mean Value Theorem connects the behavior of the differentiable function over an interval to the behavior of the derivative of that function at a particular point in the interval.

Unit 3: Integrals and the Fundamental Theorem of Calculus
1. Antidifferentiation is the inverse process of differentiation.
2. The definite integral of a function over an interval is the limit of a Riemann sum over that interval and can be calculated using a variety of strategies.
3. The Fundamental Theorem of Calculus, which has two distinct formulations, connects differentiation and integration.
4. The definite integral of a function over an interval is a mathematical tool with many interpretations and applications involving accumulation.
5. Antidifferentiation is an underlying concept involved in solving separable differential equations. Solving separable differential equations involves determining a function or relation given its rate of change.

Essential Terminology/Vocabulary

Limit, Average Rate of Change, Instantaneous Rate of Change, Tangent Line, Normal Line, Continuity Position, Velocity, Acceleration, Speed, Types of Discontinuity (Infinite, Jump, Removable), Oscillating Derivative (Using limits, Graphically, Algebraic Derivative Rules, Implicit Differentiation), Non-differentiable (Corner, Cusp, Vertical tangent, Discontinuity)

Proposed Course Materials and Resources:

Calculus of a Single Variable: Early Transcendental Functions
6th Edition
Cengage Learning
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