



Honors Pre-Calculus with Trigonometry

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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 Honors Pre-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.

Honors Pre-Calculus with Trigonometry introduces students to the major concepts and tools needed to study Calculus. Students will encounter several types of assessment within this course: unit quizzes and exams, comprehensive exams, and experimental investigations that require collecting and analyzing data using technology. The honors course will be a rigorous course, preparing all of its students to take Advanced Placement Calculus or Statistics the following year. It will be taught at a faster pace to further challenge a student who has mastered all of the advanced algebra concepts. Alternative assessments, such as projects or experiments, will be more frequent and require more detail and work outside of the classroom.

Mathematics is the foundation of science and technology. Increasingly, it plays a major role in determining the strength of the nation's work force. For students to be successful in an ever-changing society, they must have sufficient preparation in mathematics to cope with either the on-the-job demands or college expectations of mathematical literacy and skills in problem-solving, collaboration, and communication. In Pre-Calculus, students build upon the skills they have developed in prior math courses. Students will deepen their knowledge of many topics, increase their ability to communicate using mathematics, and become better problem-solvers. This course will prepare students for Calculus and is especially important to those anticipating a career in mathematics, science, or technology. Career pathways include engineering, architecture, computer programming, and actuarial science.

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 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: Honors Pre-Calculus with Trigonometry

GRADE LEVEL: 10-12

CONTENT AREA: Mathematics

Course Description:

Honors Pre-Calculus extends concepts and ideas that are studied in Pre-Calculus. It introduces students to the major concepts and tools needed to study Calculus. Student will focus on the application of linear functions, such as Break-Even Analysis. Students are introduced to a range of functions used to describe concepts and the world in which we live. They delve deeply into the theory of polynomials, and develop a strong sense of trigonometric functions and their applications. In addition, students will become proficient with matrix operations and analysis, analyze conics sections, and extend their understanding of arithmetic and geometric sequences and series. This course has been rewritten to align with College Algebra offered at the University of Missouri-St. Louis for dual credit purposes.

Course Rationale:

For students to be successful in an ever-changing society, they must have sufficient preparation in mathematics to cope with either the on-the-job demands or college expectations of mathematical literacy and skills in problem-solving, collaboration, and communication. This course will prepare students for Calculus and is especially important to those anticipating a career in mathematics, science, or technology. Career pathways include engineering, architecture, computer programming, and actuarial science.

Course Scope and Sequence

Unit 1: Linear Equations and Inequalities (Approx. 6 class periods)	Unit 2: Functions and Graphs (Approx. 7 class periods)	Unit 3: Polynomials (Approx. 14 class periods)
Unit 4: Rational Functions and Radical Equations (Approx. 7 class periods)	Unit 5: Exponentials and Logarithms (Approx. 10 class periods)	Unit 6: Trigonometry (Approx. 23 class periods)
Unit 7: Systems and Matrices (Approx. 7 class periods)	Unit 8: Conic Sections (Approx. 7 class periods)	Unit 9: Sequences and Series (Approx. 8 class periods)

Essential Terminology/Vocabulary

Equation, Inequality, Intercept, Slope, Slope-Intercept Form, Point-Slope Form, Parallel, Line, Perpendicular, Pythagorean Theorem, Relation, Function, Function Notation, Zero of a function, Domain and Range, Interval Notation, Set Builder Notation, Point or Ordered Pair, Quadrant, x-axis and y-axis, Symmetry, Even and Odd Functions, Continuity, Parent Functions, Transformation (*Shift – Scale Change – Reflection*), Piecewise Function, Composition, Inverse, Complex Numbers, Quadratic Function, Degree, Zeros, End Behavior, Extrema (*Local/relative or absolute - Minimum or maximum*), Quotient, Remainder, Factor, Polynomial, Exponent, Base, Logarithm, Argument, Rational Function, Asymptote, Point of Discontinuity, Radical Function, Extraneous Solution, Trigonometry, Degree and DMS, Radian, Complementary, Supplementary, Standard Position, Co-terminal Angles, Reference, Angle, Arc Length, Circumference, Area of a Circle, Area of a Sector, Unit Circle, Trig Functions and Cofunctions (6), 45-45-90 Triangle, 30-60-90 Triangle, Amplitude, Period, Phase Shift, Vertical Translation, Law of Sines, Law of Cosines, Fundamental Trig Identities (*Reciprocal Identities, Ratio Identities, Pythagorean Identities*), System of Equations, Substitution Method, Elimination Method, Matrix, Scalar, Row Operation, Determinant, Cramer's Rule, Conic Sections, Circle, Parabola, Ellipse, Hyperbola, Sequence, Series, Recursive, Arithmetic Sequence and Series, Geometric Sequence and Series, Pascal's Triangle, Binomial Theorem.

Unit Objectives:

Unit 1: Linear Equations and Inequalities

- Understand the concept of a function and use function notation.
- Interpret linear models.
- Interpret functions that arise in applications in terms of the context.

Unit 2: Functions and Graphs

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.
- Understand the concept of a function and use function notation.
- Represent and solve equations and inequalities graphically.

Unit 3: Polynomials

- Perform arithmetic operations with complex numbers.
- Use complex numbers in polynomial equations and identities.
- Analyze functions using different representations.

Unit 4: Rational Functions and Radical Equations

- Analyze functions using different representations.
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Represent and solve equations and inequalities graphically.
- Understand solving equations as a process of reasoning and explain the reasoning.

Unit 5: Exponentials and Logarithms

- Analyze functions using different representations.
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.
- Build new functions from existing functions.

Unit 6: Trigonometry

- Extend the domain of trigonometric functions using the unit circle.
- Define trigonometric ratios and solve problems involving right triangles.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities.

Unit 7: Systems and Matrices

- Demonstrate an understanding of Row-Echelon reduction.
- Demonstrate an understanding of matrix operations.
- Create and solve determinants of square matrices.
- Apply matrices and determinants to real world problems.
- Use coordinates to prove simple geometric theorems algebraically.
- Use technology to solve higher order dimension matrices and determinant.

Unit 8: Conic Sections

- Understand solving equations as a process of reasoning and explain the reasoning.
- Analyze functions using different representations.
- Solve equations and inequalities in one variable.
- Translate between the geometric description and the equation for a conic section.

Unit 9: Sequences and Series

- Build a function that models a relationship between two quantities.
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Write expressions in equivalent forms to solve problems.
- Perform arithmetic operations on polynomials.

Proposed Course Materials and Resources:

A Graphical Approach to Pre-calculus with Limits

6th Edition

Pearson

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