Math Department Curriculum Guide   **Precalculus – CP**

Course Description

Students who enroll in this course should be familiar with arithmetic, algebra, and geometry. They will build upon their previous mathematical knowledge and experience. The course curriculum is devoted to trigonometry and specific functions, which lead to an introduction of calculus. The graphing calculator is an essential tool in this course.

Upon successful completion of this course, students should be able to:
- Define trigonometric ratios and solve problems involving right triangles
- Apply trigonometry to general triangles
- Find arc lengths and areas of sectors of circles
- Extend the domain of trigonometric functions using the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities
- Represent and model with vector quantities
- Interpret and understand the twelve fundamental functions and notation, as they arise in application
- Construct and compare linear, quadratic, cubic, and exponential models and solve problems

Graphing Calculator Policy and Skills

Hanover High School students enrolled in Algebra 1, Algebra 2, Precalculus, Calculus, or Statistics should purchase a graphing calculator, preferably a TI-84 Plus or TI-84 Color. It is important for students to gain familiarity with their own calculator in order to use it as a tool during class and for homework. Furthermore, students are expected to use calculators on standardized assessments, including MCAS, PSAT, SAT, and AP, as well as college placement exams. Many of the questions on these assessments are designed in such a way that students are expected to use a graphing calculator. Although there are graphing calculator apps that can be downloaded and used on mobile devices, keep in mind that mobile devices are not allowed on the MCAS, PSAT, SAT, and AP exams. Therefore, it is important that students have access to and learn to use an assessment-approved graphing calculator. There is a limited number of graphing calculators that can be borrowed on a first come first serve basis – please contact the office for information.

Precalculus – Calculator Skills
- ➢ Perform operations with fractions and exponents
- ➢ Convert between decimals and fractions
- ➢ Convert between degrees and radians
- ➢ Enter equations in y =
- ➢ Manipulate the window
- ➢ Manipulate and use the table
- ➢ Graph linear, quadratic, cubic, trigonometric, exponential, logarithmic, and rational functions
- ➢ Analyze functions by using tables, graphs, and equations
- ➢ Find points of intersection, zeros, maximums and minimums
- ➢ Solve trigonometric equations

Content Standards

Number and Quantity
    The Complex Number System
        A. Perform arithmetic operations with complex numbers.
        B. Represent complex numbers and their operations on the complex plane.
        C. Use complex numbers in polynomial identities and equations.
    Vector and Matrix Quantities
        A. Represent and model with vector quantities.
        B. Perform operations on vectors.
        C. Perform operations on matrices and use matrices in applications.
Algebra
    Arithmetic with Polynomials and Rational Expressions
        C. Use polynomial identities to solve problems
        D. Rewrite rational expressions.
    Reasoning with Equations and Inequalities
        C. Solve systems of equations.
Functions
    Interpreting Functions
        C. Analyze functions using different representations.
    Building Functions
        A. Build a function that models a relationship between two quantities.
        B. Build new functions from existing functions.
    Trigonometric Functions
        A. Extend the domain of trigonometric functions using the unit circle.
        B. Model periodic phenomena with trigonometric functions.
        C. Prove and apply trigonometric identities.
Geometry
    Similarity, Right Triangles, and Trigonometry
        D. Apply trigonometry to general triangles.
    Circles
        A. Understand and apply theorems about circles.
    Expressing Geometric Properties with Equations
        A. Translate between the geometric description and the equation for a conic section.
    Geometric Measurement and Dimension
        A. Explain volume formulas and use them to solve problems.

Subject: Precalculus

Units	Content
Functions Term 1 September	▪ Analyzing Functions ○ Domain, range, continuity, end behavior, increasing, decreasing, maximums and minimums ▪ Twelve basic functions ▪ Compositions of functions ▪ Inverse functions ▪ Graphical Transformations
Polynomial and Rational functions Term 1 September	▪ Linear and quadratic functions ▪ Polynomial functions of higher degree ○ End behavior and real zeros ▪ Complex zeros ▪ Fundamental Theorem of Algebra ▪ Graphing rational functions
Trigonometric Functions Term 1 and Term 2 October through December	▪ Angles and their measures ▪ Trigonometric functions of acute angles ▪ The Unit Circle ▪ Graphing of Sine and Cosine and their transformations ▪ Graphing of Tangent, Cotangent, Secant, and Cosecant functions ▪ Inverse trigonometric functions
Analytic Trigonometry Term 2 January and February	▪ Fundamental Identities ▪ Proving trigonometric identities ▪ Sum and Difference Identities ▪ Multiple-Angle Identities ▪ The Laws of Sines ▪ The Law of Cosines
Applications of Trigonometry Term 4 May and June	▪ Vectors in a plane ▪ Dot product of vectors ▪ Parametric equations and motion ▪ Polar Coordinates ▪ Graphs of Polar Equations ▪ DeMoirve's Theorem and nth roots (enrichment)
Exponential and Logarithmic Functions Term 3 March and April	▪ Exponential Functions and their graphs ▪ Exponential Modeling ▪ Properties of logarithmic functions ▪ Logarithmic functions and their graphs ▪ Equation solving and modeling

Units	Content
Analytic Geometry (optional enrichment) Term 4 June	▪ Circles, Parabolas, Ellipses (review) ▪ Hyperbolas ▪ Translation and Rotation of Axes ▪ Polar Equations of Conics ▪ Three-Dimensional Cartesian Coordinate System
Discrete Mathematics (optional enrichment) Term 4 June	▪ Combinatorics ▪ Binomial Theorem ▪ Probability ▪ Sequences and Series ▪ Mathematical Induction ▪ Statistics and Data
Introduction to Calculus Term 4 June	▪ The Tangent Problem ▪ The Area Problem ▪ Limits ▪ Introduction to Numerical Derivatives and Integrals