

University at Buffalo
GIFTED MATH PROGRAM

Course IV Curriculum

Textbooks: *The Art of Problem Solving: Intermediate Algebra* by Richard Rusczyk and Matthew Crawford; *GMP IV Problem Sets* with problems from Philips Exeter Academy Mathematics Department

FUNDAMENTAL CONCEPTS OF ALGEBRA

Algebraic Expressions and Real Numbers; Exponents and Scientific Notation; Radicals and Rational Exponents; Polynomials; Factoring Polynomials; Rational Expressions; Equations; Modeling with Equations; Linear Inequalities and Absolute Value Inequalities; Vieta's Formula

FUNCTIONS AND GRAPHS

Graphs and Graphing Utilities; Basics of Functions and Their Graphs; Linear Functions and Slope; Transformations of Functions; Combinations of Functions; Composite Functions; Inverse Functions; Distance and Midpoint Formulas; Circles; Modeling with Functions

POLYNOMIAL AND RATIONAL FUNCTIONS

Complex Numbers; Quadratic Functions; Polynomial Functions and Their Graphs; Dividing Polynomials; Remainder and Factor Theorems; Zeros of Polynomial Functions; Rational Functions and Their Graphs; Polynomial and Rational Inequalities; Modeling Using Variation

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

Exponential Functions; Logarithmic Functions; Properties of Logarithms; Exponential and Logarithmic Equations; Exponential Growth and Decay; Modeling Data

TRIGONOMETRIC FUNCTIONS

Angles and Radian Measure; Trigonometric Functions: The Unit Circle; Right Triangle Trigonometry; Trigonometric Functions of Any Angle; Graphs of Sine and Cosine Functions; Graphs of Other Trigonometric Functions; Inverse Trigonometric Functions; Applications of Trigonometric Functions

ANALYTIC TRIGONOMETRY

Verifying Trigonometric Identities; Sum and Difference Formulas; Double-Angle, Power-Producing, and Half-Angle Formulas; Product-to-Sum and Sum-to-Product Formulas; Trigonometric Equations

ADDITIONAL TOPICS IN TRIGONOMETRY

The Law of Sines; The Law of Cosines; Polar Coordinates; Graphs of Polar Equations; Complex Numbers in Polar Form; DeMoivre's Theorem; Vectors; The Dot Product

SYSTEMS OF EQUATIONS AND INEQUALITIES

Systems of Linear Equations in Two Variables; Systems of Linear Equations in Three Variables; Partial Fractions; Systems of Nonlinear Equations in Two Variables; Systems of Inequalities

STATISTICS

Probability review, data distributions; measures of center and variability, Experimental Design; Normal and t distributions, Confidence Intervals and Hypothesis testing of means and population proportions;

SEQUENCES AND SERIES

Arithmetic; Geometric; summation and product notation; Nested sums and products; Algebra of Recursive Sequences; Telescoping; Sums of Polynomial Series; Finite Differences

MATRICES AND DETERMINANTS (optional)

Matrix Solutions to Linear Systems; Inconsistent and Dependent Systems and Their Applications; Matrix Operations and Their Applications; Multiplicative Inverses of Matrices and Matrix Equations; Determinants and Cramer's Rule