OM011: Honors Beginning Algebra Syllabus

Course Description
Honors Beginning Algebra is a rigorous first course in algebra. Students study the basic arithmetic properties of the real numbers and computations involving algebraic expressions, especially in the context of linear and polynomial equations and inequalities. Emphasis is given on conceptual understanding and using ideas from algebra to model physical problems [word problems]. Technology will be used for visualization and some computation and visualization, but students will also develop sufficient computational skills to perform elementary computations entirely by hand.

Course Topics

- **The Real Number System**
  Arithmetic of Fractions, Exponents, The Order of Operations, Variables, Algebraic Expressions, The Real Number Line, Addition, Subtraction, Multiplication, Division, Properties of Real Numbers

- **Linear Equation and Inequalities in One Variable**

- **Linear Equations and Inequalities in Two Variables**
  The Cartesian Plane, The Graph of a Line, Slope, Slope-Intercept Form, Point-Slope Form, Standard Form, Linear Inequalities, Introduction to Functions

- **Systems of Linear Equations and Inequalities**
  Solving Systems by Graphing, Substitution, and Addition, Applications, Systems of Inequalities

- **Polynomials**
  Exponent Rules, Integer Exponents, Scientific Notation, Operations on Polynomials, Special Products, Polynomial Long Division

- **Factoring**
  The Greatest Common Factor, Factoring by Grouping, Trinomials, Special Factorizations, Solving Quadratic Equations by Factoring, Applications

- **Rational Expressions and Equations**
  Simplifying Rational Expressions, Operations on Rational Expressions, Complex Fractions, Solving Rational Equations, Applications, Variation

- **Radical Expressions and Equations**
  Evaluating Roots, Simplifying Radicals, Operations on Radicals, Solving Radical Equations, Rational Exponents

- **Quadratic Equations**
  The Square Root Property, Completing the Square, The Quadratic Formula, Complex Numbers, Graphing Quadratic Functions
Learning Objectives

Upon successful completion of Honors Beginning Algebra, students will demonstrate proficiency in:

- Applying techniques related to the above topics to solve problems
- Understanding the nature of rigorous logical thinking
- Expressing mathematics clearly, in both written and oral communication
- Working creatively toward solutions to novel problems
- Understanding the qualitative differences between linear, polynomial, rational, and radical expressions as well as their typical applications

Key Assignments

Each semester, the letter grade in the course will be determined based on performance on the following types of assignments.

- **In class participation:** Students are expected to participate in in-class discussion sections, and are expected to have a functioning graphics tablet for presenting problems and asking questions during discussion sections. Students will contribute to and be part of an active learning environment. Homework assignments: Students will complete regular homework assignments (written and/or electronic) to demonstrate their mastery and knowledge of the material covered in each week’s lectures and discussion sections.

- **Written exams:** Students will complete written exams at the end of each major unit to test depth of understanding and the ability to integrate knowledge of course concepts to solve problems. Midterm and final exams: There will be comprehensive, proctored midterm and final exams each semester. These exams will include material covered in lecture, discussion, homework assignments, and exams.