**Final Exam: 12:00-2:00pm - Monday, December 14th. in Hagan Hall Room 113**

**Part 1:** Chapter P - Prerequisites: Fundamental Concepts of Algebra

**Key Topics:**
• Number systems (Integers, Rational, Irrational, Real, Complex), properties of real numbers
• Sets of numbers, basic set operations, inequalities and absolute value.
• Properties of exponents, simplifying expressions involving exponents, negative and rational exponents
• Radical notation, simplifying radicals, rationalizing denominators
• Polynomials, operations on polynomials, factoring polynomials (greatest common factor, trinomials, grouping, difference of squares, perfect squares)
• Rational expressions, simplifying rational expressions (sums, differences, products, and quotients)

**Not Tested:** scientific notation, cubic factoring formulas

**Chapter P - Review Problems:** pp. 86-78 # 1, 3, 6, 7, 8, 11, 16, 18, 21, 26, 31, 34, 37, 41, 48, 50, 53, 62, 67, 71, 74, 79, 80, 83, 88, 91, 96, 99, 104, 107, 110, 114, 117, 120

**Part 2:** Chapter 1 - Equations and Inequalities

**Key Topics:**
• Cartesian coordinates, plotting points, graphing equations, $x$ and $y$ intercepts of graphs
• Solving linear equations, equations that are linear in form, and rational equations
• Solving application problems (the 5 step strategy)
• Quadratic equations (solving by factoring, completing the square, the quadratic formula, and the discriminant)
• Complex Numbers (definition of $i$, addition/subtraction, multiplication, division of complex numbers, powers of $i$), quadratics with complex solutions
• Other equations (factoring by grouping, rational exponents, radical equations, quadratic substitution, absolute value equations)
• Linear and Absolute Value Inequalities (also: interval notation and graphing solutions to inequalities)

**Chapter 1 - Review Problems:** pp. 191-194 # 1, 2, 3, 4, 6, 7, 9, 11, 12, 17, 21, 29, 31, 39, 42, 43, 45, 47, 50, 54, 58, 62, 65, 67, 69, 73, 79, 86, 89, 92, 95, 98, 99, 104, 111, 116, 117, 120

**Part 3:** Chapter 2 - Functions and Graphs and Section 8.1 - Systems of Linear Equations

**Key Topics:**
• functions (definition, vertical line test, increasing/decreasing/constant), domain and range of a function (finding algebraically and graphically), evaluating functions, difference quotients, function notation
• Increasing and decreasing functions, maximum and minimum values. Even and odd functions (symmetry with respect to the $y$-axis and with respect to the origin)
• lines, slope, point-slope, slope-intercept, general form, parallel and perpendicular lines, graphing lines, vertical/horizontal lines, graphing piecewise defined functions, the average rate of change of a function on an interval
• Transformations of functions, graphing functions using one of more of the 6 basic transformations.
• Combinations of functions (sums, differences, products, quotients, and composition), evaluating combinations of functions, composing and decomposing functions, finding the domain of a combinations of two functions, evaluating functions and combinations of functions using tables of values
• One-to-one functions, showing a function is or is not one-to-one, the horizontal line test.
• Inverse functions, finding a formula for the inverse of a function, domain, range, composition and the inverse function theorem, graphs of inverses
• distance, midpoints, the Pythagorean Theorem, and circles (finding and interpreting equations, graphing)
• Understand the definition of a system of linear equations in two unknowns as well as the three possibilities for the number of solutions to such a system [1, none, or infinitely many].
• Know how to find the solution to a system of linear equations using the substitution or elimination.
• be able to solve basic application problems using systems of linear equations.

**Chapter 2 - Review Problems:** pp. 306-308 # 1, 3, 5, 8, 9, 12, 14, 17, 20, 22, 23, 25, 26, 27, 28, 31, 32, 34, 36, 37, 38, 41, 42, 44, 47, 48, 49, 50, 51, 53, 57, 60, 63, 72, 73, 75, 76, 77, 79, 81, 86, 89, 92, 93, 98, 100, 102, 105

**Chapter 8 - Review Problems:** pp. 815-816 # 1, 2, 3, 5, 6, 10

**Part 4:** Chapter 4 - Exponential and Logarithmic Functions

**Key Topics:**
• Exponential Functions (definition, properties of exponents, graphs of exponentials), compound interest, applications, the number $e$,
• Exponential growth and decay, population modeling and half-life applications
• Logarithmic Functions (definition, graphs of logarithms, ln and log), changing between exponential and logarithmic form, evaluating logarithms, the change of base formula
• properties of logarithms, simplifying and expanding logarithmic expressions
• Solving exponential and logarithmic equations of various forms

**Chapter 4 - Review Problems:** pp. 475-478 # 5, 6, 7, 10, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23, 24, 25, 27, 28, 30, 33, 34, 36, 41, 45, 50, 52, 54, 56, 58, 61, 62, 64, 66, 70, 76, 78, 84, 85, 88, 91

**Part 5:** Chapter 3 - Polynomial Functions

**Key Topics:**
• Quadratic Functions, finding the vertex and axis of symmetry, finding intercepts, graphing, applications
• Graphing polynomial functions, end behavior and the leading term test, finding intercepts, zeros and multiplicity, the Intermediate Value Theorem, turning points
• Long division of polynomials, synthetic division, finding zeros using division, evaluating polynomials using synthetic division, the factor theorem
• The rational zero theorem, factoring polynomials by finding rational zeros, solving equations by finding rational zeros
• Solving polynomial functions using the graphical method, solving polynomial and rational functions using boundary points and test values

**Chapter 3 - Review Problems:** pp. 406-409 # 2, 4, 8, 9, 10, 11, 16, 17, 21, 22, 24, 25, 26, 28, 29, 30, 31, 32, 33, 35, 36, 38, 49, 69, 70, 73, 74