ALGEBRA EXAM MATERIAL AND EXPECTATIONS

For the cumulative algebra exam, you should be able to do the following things:

Chapter 1.
- Use interval notation when describing real numbers
- Write expressions with negative exponents as fractions, and write expressions with rational exponents as radicals, and vice-versa
- Multiply two or more polynomials together
- Factor general polynomials by factoring out GCF and by grouping
- Factor polynomials of form $ax^2 + bx + c$
- Write rational expressions in lowest terms
- Add, subtract, multiply, and divide rational expressions

Chapter 2.
- Use the midpoint and distance formulas for points in the xy-plane
- Write the equation of a circle when you're given the center and radius
- Find the center and radius of a circle when you're given an equation for it
- Find equations of lines satisfying certain conditions, such as:
  - a line through a point (x_1, y_1) with slope m
  - a line through points (x_1, y_1) and (x_2, y_2)
  - a line through a point (x_1, y_1) that is parallel to $y = mx + b$
  - a line through a point (x_1, y_1) that is perpendicular to $y = mx + b$
- Solve basic linear equations
- Solve quadratic equations by factoring or using quadratic formula
- Use the quadratic formula to find all real and complex solutions of a quadratic
- Solve equations of quadratic type by making a substitution
- Solve equations with rational expressions or radicals
- Solve linear inequalities
- Solve quadratic inequalities
- Solve higher order polynomial and rational inequalities
- Solve linear absolute value equations and inequalities

Chapter 3.
- Express a function through a formula
- Plug in numbers and algebraic expressions into a formula for a function
- Find the domain of a function
- Use the vertical line test to determine if a curve is the graph of a function
- Make a table of values for a function and plot the points to sketch the graph
- Use the graph of a function to find:
  - domain and range
  - intervals where f is positive and where f is negative
  - intervals where f is increasing and where f is decreasing
  - local maxima and local minima of f

- Find the average rate of change of a function between two points
- Use the graph of $y = f(x)$ and graph transformations to sketch a graph of $y = Af(Bx + C) + D$
- Find the formula for $f \circ g$ given the formulas for f and g
- Use the horizontal line test to determine if a function is one-to-one
- Find the formula for $f^{-1}(x)$ from the formula for $f(x)$

Chapter 5.

- Put a quadratic function in standard form by completing the square
- Find the vertex of a quadratic function
- Find the maximum or minimum value of a quadratic function and know difference between max or min
- Use the degree and the leading coefficient to determine end behavior of a polynomial
- Use the multiplicity of a zero of a polynomial to determine the behavior of the graph near the zero
- Sketch a graph of a polynomial based on its zeros, their multiplicities, and the end behavior
- Find the quotient and remainder of a division of polynomials
- Use the Factor Theorem to factor higher-degree polynomials by knowing one or more of the zeros
- Use the Factor Theorem to construct polynomials with certain given zeros

Chapter 6.

- Evaluate values of exponential functions and recognize their graphs
- Display understanding of logarithms by translating equations between exponential form and logarithmic form
- Evaluate values of logarithmic functions and recognize their graphs
- Find the domain of functions involving logarithms
- Use the change of base formula to write logarithms of other bases in terms of ln
- Use the log laws to expand out logarithmic expressions into smaller pieces
- Use the log laws to write a sum of multiples of logs as a single log
- Solve exponential and logarithmic equations
- Use the formulas for compound interest and continuously compounded interest to solve interest problems

Chapter 11.

- Use elimination or substitution to solve systems of two linear equations in two variables
- Use the method of elimination and back-substitution to solve systems of three or more linear equations