

# Algebra II – Outline for Final Exam 2009

## \* Function concepts

- o Definition as a set of ordered pairs, as a rule, compared with relations
- o Function notation
- o Independent and dependent variable; domain and range
- o Graphs of functions and relations
- o Arithmetic operations on functions
- o Piecewise-defined functions
- o Inverse functions
  - + Graphical meaning and in terms of ordered pairs
  - + How to compute
  - + Whether an inverse exists
- o Applications and modeling

## \* Linear functions and relations

- o Slope-intercept and point-slope form
- o Graphs and use of a coordinate system
- o Geometric interpretation of slope and slope as a rate
- o Solving linear equations
- o Linear inequalities in one and two variables
- o Absolute value equations and inequalities - solved by graphing
- o Applications and modeling

## \* Systems of linear equations and inequalities

- o Solving algebraically (substitution and elimination) and by graphing
- o Linear programming
- o Applications and modeling

## \* Quadratics

- o Terminology: intercept, root, zero, solution.
- o Graphing: roots, y-intercept, vertex, symmetric points, axis of symmetry.
- o Vertex form
- o Solving
  - + Common factor and quadratic factoring
  - + Completing the square
  - + Ways to find the vertex: vertex form,  $-b/2a$ , symmetry, graphing calculator
  - + The quadratic formula
  - + Relationship between factoring and the quadratic formula
  - + Relationship between discriminant and roots
- o Complex numbers
  - + The imaginary unit  $i$
  - + Solving quadratics with complex roots
  - + Arithmetic (add, subtract, multiply, divide)

## \* Polynomials

- o Vocabulary: Degree, coefficient, leading coefficient, term, nth degree, term, constant term, root=solution=zero=x-intercept, complete factoring
- o Multiplying
- o Factoring
  - + Common factor
  - + Difference of squares, perfect squares
  - + Long division algorithm

- + Synthetic division
  - o Finding roots
    - + The factor/remainder theorem
    - + When complete factoring is possible
    - + Use of calculator to solve
  - o Graphs and curve sketching
    - + End behavior
    - + Number of roots/changes in sign
    - + Bounce/Cross (multiplicity)
    - + Finding a function from a graph
  - o Applications and modeling
- \* Powers, roots and radicals
    - o nth roots
    - o Solving radical equations by graphing
    - o Applications and modeling
  - \* Rational equations and functions
    - o Inverse
    - o Solving rational equations by graphing
    - o Add, subtract, multiply and divide rational expressions
    - o Applications and modeling
  - \* Exponents and logarithms
    - o Basic laws of exponents, negative and rational exponents, roots
    - o Logarithm as the inverse of exponentiation
      - + Logarithmic notation
      - + Log rules (product, quotient, power and change of base rule)
    - o Solve exponential equations, with and without calculator
    - o Solve log equations, with and without calculator
    - o Find an exponential equation from two points
    - o Graphs of exponential and logarithmic functions
    - o Applications and modeling e.g. growth and decay, bank interest and depreciation.
  - \* Counting principles and probability
    - o Counting problems
      - + Factorials, permutations  $nPr$
    - o Simple probability: cards, dice
    - o Rules of probability
      - + Conditional probability
      - + Venn Diagrams
    - o Applications and modeling

## Calculator Skills

- \* Graph and analyze more advanced functions
- \* Find zeros of functions using tables and graphs
- \* Perform matrix operations (add, subtract, multiply, find inverses)
- \* Solve systems of equations using matrices