Advanced Algebra
Solving Polynomial Functions – Summary of Procedure

1. If the polynomial has no constant, factor out the GCF --- one solution to the equation is now ZERO. If the remaining polynomial is still degree > 2 then proceed with the steps outlined below to solve for the other solutions. From this point on, you are solving the remaining polynomial, not the original polynomial.
2. State the # of solutions (Fund. Theorem. of Algebra).
3. Use Descartes' Rule of Signs to state the *possible* # of positive and negative Real Roots and Imaginary Roots.
4. List the possible Rational Roots (Rational Root Theorem).
   ** You may be able to eliminate some possible roots if there are no positive or negative roots (step 2) **
5. Using the Factor Theorem, substitute each possible root, *c*, from step 3 into the polynomial until you find one for which f(*c*) = 0. Thus, *c* is a solution. Synthetically divide the polynomial by the root, *c*; the result is the depressed polynomial.
6. If the depressed polynomial is quadratic (deg = 2), go to step 7, otherwise repeat steps 3 – 5 with the depressed polynomial, finding more solutions until the depressed polynomial is a quadratic.
   * *Note*: The same number can be a solution more than once; don't eliminate a number from the list of possible roots just because it has already been found to be a solution.
   ** *Note*: If a number was found previously to NOT be a root, then it CANNOT be a root of the depressed polynomial, so you do not need to try the number again.
7. Solve the remaining quadratic equation by either factoring or using the quadratic formula (the quadratic formula is required if the other solutions are irrational or imaginary).
8. List all solutions, including every rational root that you used to create depressed polynomials and the solutions to the depressed quadratic.