Quadratic Equation - Part I

Objectives:  To solve quadratic equations by using the graphing application and calculator on the graphing calculator.
            To use the discriminant to determine how many solutions a quadratic equation.

Materials:  Graph paper with 3 \( (x, y) \) coordinate planes and space available for notes
            Graphing Calculator (TI82 or newer)
            Paper, pencil and straightedge

Introduction: To this point, the student has thoroughly studied solved linear equations. They have also solved quadratic equations by graphing and completing the square. This means that they have found zeros, roots, and solutions. This series of lessons is designed to study the quadratic formula which is another technique used to solve quadratic equations. If used correctly, it will lead the student to solutions that are real and imaginary.

The student will need the ability to read and recognize the terms of the quadratic equation. The student will need the ability to substitute values into a formula. The student will also need the ability to use the order of operations at a high level. Lastly, the student will need the ability to analyze solutions.

Procedures: Historical Perspective:
http://www.algebra.com/algebra/homework/quadratic/Quadratic equation.wikipedia#History

Introduction/Warm-up: Finding solutions to 3 quadratic equations by using a graphing calculator. The student will use the graph paper to construct the each graph on a graphing grid.

Examples:  1) \( y = x^2 - 6x + 2 \)
           2) \( y = -16x^2 + 60x + 4 \)
           3) \( y = 5x^2 + 6x + 4 \)
           4) \( y = x^2 - 6x + 9 \)

Connect the quadratic equation, \( f(x) = ax^2 + bx + c \) to the quadratic formula, \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \) where \( f(x) = 0 \). (The symbol \( \pm \) is used here for \( \pm \) because my computer software has a problem.)

Lesson: The teacher will guided the student through the process of finding the number and types of solutions by solving and evaluating the discriminant.

\[
\begin{align*}
(b^2 - 4ac) & > 0 \\
(b^2 - 4ac) & = 0 \\
(b^2 - 4ac) & < 0
\end{align*}
\]
Closure: The student will independently find the type of solution by using the discriminant.

Adaptation: If your classroom has a smart board or computer projection capability, various websites may have relevant can creative lesson applications. (See Links) Also, Maple computing software can be used to create classroom models to aid student visualization.

Discussion Questions: How many times will the quadratic equation cross (intersect) the x-axis \((y = f(x) = 0)\)?

What are number and type of solutions (zeros, roots) for the following equations?

Examples:
1) \(y = x^2 - 6x + 2\)
2) \(y = -16x^2 + 60x + 4\)
3) \(y = 5x^2 + 6x + 4\)
4) \(y = x^2 - 6x + 9\)

Assessment/Evaluation: The student will independently evaluate various quadratic equations for number and types of zeros.

Suggested Reading: Text from issued text book
Internet Search

Links: 
http://www.algebra.com/algebra/homework/quadratic/Quadratic_equation.wikipedia#History
http://www.mathnstuff.com/math/spoken/here/2class/320/quadequ.htm
http://www.tpub.com/math1/17f.htm
http://www.purplemath.com/modules/quadform2.htm
http://www.riverdeep.net/math/destination_math/dm_tools/algebra1.2/algebra_II.3.23.jhtml
http://www.algebra.com/algebra/homework/quadratic/

Vocabulary/processes: Solutions, zeros, roots, discriminant, quadratic equations, quadratic formula, lead coefficient, coefficients, constant, substitution, order of operation.

Academic Standards: TEKS: Alg II - b2A, c1A, d1B, d3B

Time of Lesson: 50 minutes

Tips on teaching the lesson: Connect the quadratic equation to the solutions found on the x-axis to the solutions found by the quadratic formula.