**Proving the Quadratic Formula**

1. Study this solution to a quadratic equation by completing the square. Fill in the blanks below.

Here is the equation:

**Step 1:** Divide by 3 on both sides.

**Step 2:** Complete the square by adding on both sides.

**Step 3:** Write the first three terms as a binomial square.

**Step 4:** Subtract \_\_\_\_\_\_\_\_\_\_\_ on both sides.

**Step 5:** Find a common denominator on the right side.

**Step 6:** Multiply the numerator and denominator on the right

side by 3 to make the denominator a perfect square.

**Step 7:** Put both terms on the right over the common

denominator to obtain a single fraction.

**Step 8:** Take square roots on both sides.

**Step 9:** Subtract\_\_\_\_\_\_\_ on both sides.

1. Explain these details.
2. In Step 2 what quantity is added on both sides?
3. In Step 4 what quantity is subtracted on both sides?
4. In Step 6 why is a perfect square?
5. What happened to going from Step 7 to Step 8?
6. In Step 9 what quantity is subtracted on both sides?
7. In the original equation identify the value of each parameter:

*a* = \_\_\_\_\_\_\_\_ *b* = \_\_\_\_\_\_\_\_ *c* = \_\_\_\_\_\_\_\_

1. Substitute for *a, b,* and *c* in Step 9 of the solution. This should give you the quadratic formula.

*x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Simplify the result in Step 9, leaving the values of *x* with radicals in the solutions.
2. Find decimal approximations to the solutions in Step 9.
3. Use Step 3 of the solution to find the vertex of the function
4. Graph the function . Use the graph to find the vertex and estimate the *x*-intercepts. Check these values with those found in question 6 and question 7.
5. Use the same nine steps to derive the general quadratic formula using the parameters *a, b,* and *c,* rather than the specific values given in question 1.