Derivation of the Solution to the Quadratic Equation

Given the equation



Where  is non-zero, one can derive the solution by completing the square. First divide both sides by 

To obtain

.

Now subtract the constant from each side to obtain

.

Now make the left side a perfect square by adding  to each side.

.

The left side is now

and the right side is

 where the numerator and denominator of the first term were multiplied by  to make the denominator the same as the other term. Now the right side



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Now if we take the square root of both sides, we obtain

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Subtracting  from each side and noting that the denominator on the right side is

, we obtain



This is the general solution to the quadratic equation.