

# Writing Quadratic Equations in Vertex Form

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Hello! In this video, I would like to share with you ways to transform the graphs of quadratic functions. First off, it's important to note that parent functions are the simplest form of a family of functions. In other words, a parent function can be modified, or transformed, in shape to meet the needs of a particular set of conditions. For quadratic functions in standard form, the parent form that preserves the general shape of the graph is,  $f(x) = x^2$ .

We use the complete the square method to establish the Vertex form of a quadratic that is written in standard form. The Vertex form is the best way to identify transformations of the parent graph into its new form. The following steps outline the general process for rewriting a quadratic function into vertex form, but we may not have to utilize each step. Step one is to isolate "c" by grouping the first two terms of the quadratic in standard form. Then we identify a greatest common factor in this group in order to reduce the a-value to one. In step three, we utilize a mini-formula to complete the square trinomial. We will add half of b, squared inside the grouping symbol. Since we are systematically selecting a value to add inside the parentheses, in step four, we must modify the outside of the parentheses to keep the equation balanced. Be careful at this step, since the number you modify on the outside might not be the same as the number inside. We'll see this happen in example two below. Finally, in step five, we rewrite the quadratic in vertex form, by factoring the square trinomial we just created.

Here are two examples. In number one, we could isolate c easily <pause>, and after that we would skip step two since the a-value is already one. I'll rewrite the function now with a little more space in the grouping symbols to make room for step three <pause>. Our b-value is negative four, and half of that is negative two, which squared is four. This will be the number we use to complete the square trinomial <pause>. Immediately, I will subtract four so that our net result is zero and the equation remains balanced <pause>. Finally, factor the square trinomial <pause>, combine like terms on the outside, and observe the vertex form of the quadratic function!

In example two, after grouping the first two terms, we should factor negative two from the first two terms <pause>. After completing the square <pause>, we should add eighteen to the outside of the grouping symbol. We do this because of the nine written inside, is affected by the negative two distributing from the outside. Negative two times nine is negative eighteen and to offset that, we add eighteen on the outside. And after factoring we are left with a function written in vertex form.