Subject: Algebra
Created by: Matthias Fisseha
Revised: 07/09/2018

Standard (Vertex) Form

What is standard (vertex) form of a quadratic function?

- Vertex form is a way to rewrite a quadratic function in a way that the vertex can be identified easily.

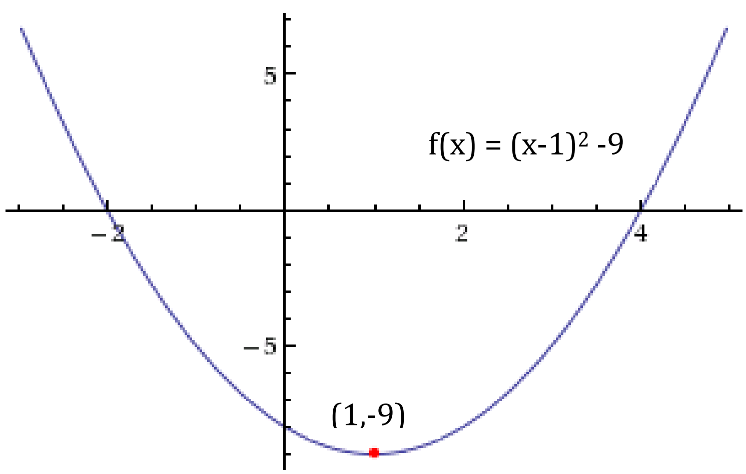
- The standard (vertex) form is as follows: $f(x) = a(x-h)^2 + k$, where (h, k) is the vertex of the function and a is the quadratic coefficient.

How can a quadratic function be rewritten in vertex form?

- A quadratic function can be rewritten in vertex form by completing the square.

- The following is an example:

$f(x) = x^2-2x-8$	The given function is in the form $f(x) = ax^2 + bx + c$ form.
$f(x) = (x^2-2x) - 8$	First, group the x^2 and x terms.
$f(x) = (x^2-2x+1) - 8 - 1$	Then, add $(b/2)^2$ inside the parentheses and subtract the same value on the outside.
$f(x) = (x-1)(x-1) - 9$	Next, factor the expression in the parentheses and combine like terms.
$f(x) = (x-1)^2 - 9$	Finally, simplify. The vertex is (1, -9).



- Here is another example that is a bit more complicated:

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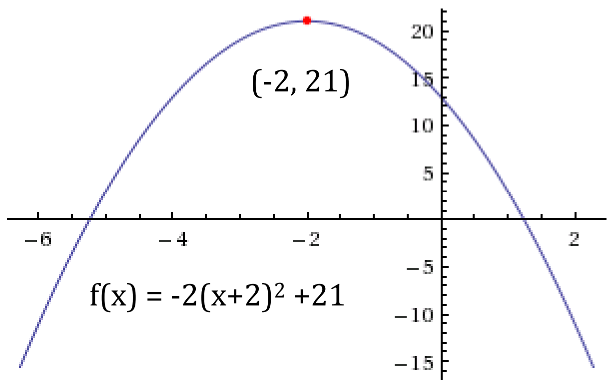
$f(x) = -2x^2-8x+13$	The given function is in the form $f(x) = ax^2 +bx +c$ form.
$f(x) = (-2x^2-8x) +13$	First, group the x^2 and x terms.
$f(x) = -2(x^2+4x\ ) + 13$	Factor out any common numbers.
$f(x) = -2(x^2+4x+4) + 13 -4(-2)$	Then, add $(b/2)^2$ inside the parentheses and subtract the same value on the outside. This time, when subtracting by $(b/2)^2$ on the outside, multiply it by the number that was factored out.
$f(x) = -2(x+2)(x+2) +13+8$	Next, factor the expression in the parentheses and multiply.
$f(x) = -2(x+2)^2 +21$	Finally, simplify. The vertex is (-2, 21).



You Try!

-Try rewriting the following functions in standard (vertex) form:

$f(x) = 3x^2-12x-3$

$f(x) = -6x^2+18x-9$

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The following works were referred to during the creation of this handout: [Wolfram Alpha].

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