Converting General Form to Vertex Form

Complete the Square

$$y = ax^2 + bx + c,$$

What would happen if we were given an equation such as $y = x^2 + 6x - 1$ and asked to graph it? We could change the equation to Vertex Form by Completing the Square.

The first thing we should realize is only one of the variables is squared, so the graph of the equation is a parabola. If that's the case, how do we find the vertex? That's right, we have to change the equation into Vertex Form by completing the square. Let's do one.

Graphing Parabolas – General Form

$$y = ax^2 + bx + c$$

Strategy – In the equation $y = ax^2 + bx + c$: find the vertex, pick a convenient point and then use symmetry to graph.

Procedure

1. Find the vertex by completing the square, *a* must be 1
Whatever is being added MUST be subtracted
2. Pick a convenient point, 0, (y_{int}) if possible, to find a second point
3. Use symmetry to find 3rd point
4. Sketch the graph

$y = x^2 + 6x - 1$	Given
$y = x^2 + 6x + \_\_ - 1 + \_\_$ 3 (1/2 linear term)	Complete Square
$y = x^2 + 6x + 9 - 1 + (-9)$	Square, then Add & Subtract 9
$y = (x + 3)^2 - 10$	Factor/combine terms

The graph is a parabola that opens up with vertex (–3, –10).

The y_{int} is (0, –1), using symmetry, a third point is (–6, –1)

Sketch the graph