Purpose: In this problem set, you will be utilizing our factoring methods to graph quadratic functions.

Definition: A quadratic function can be represented in many ways including

$$\textbf{Standard Form: } f(x) = ax^2 + bx + c$$

and

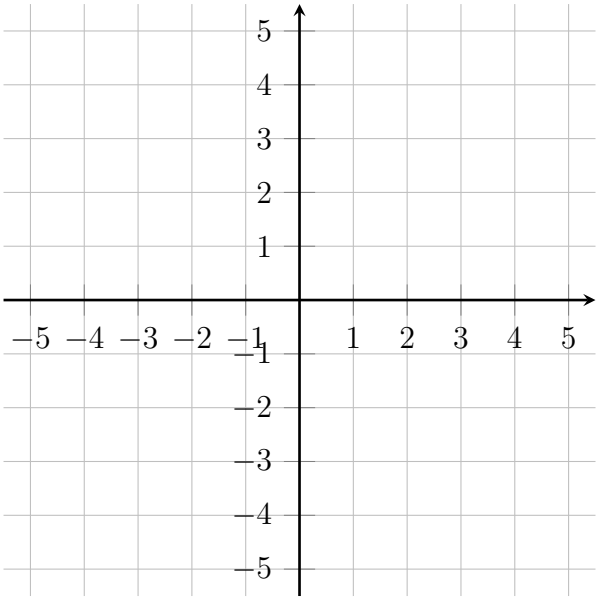
$$\textbf{Vertex Form: } f(x) = a(x-h)^2 + k,$$

where $h = -\dfrac{b}{2a}$ and $k = f(h)$.

Question of the day: What does the graph of $f(x) = a(x-h)^2 + k$ look like, and what types of problems can we solve with this information?

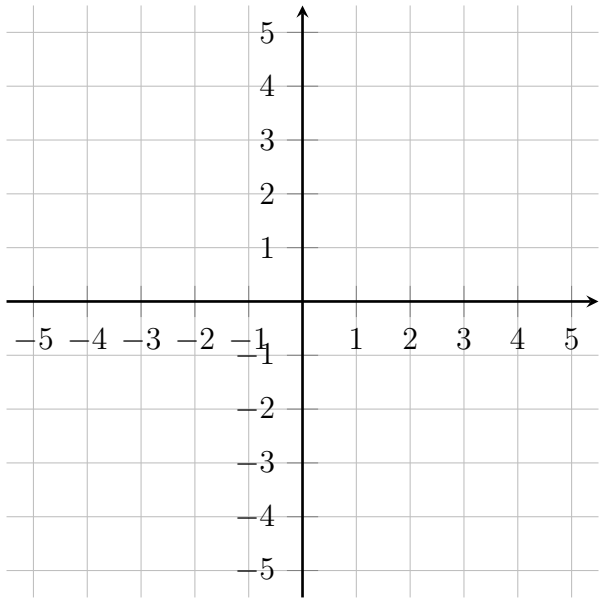
1. Graph the following function given in standard form.

$$f(x) = x^2 - 2x + 1$$



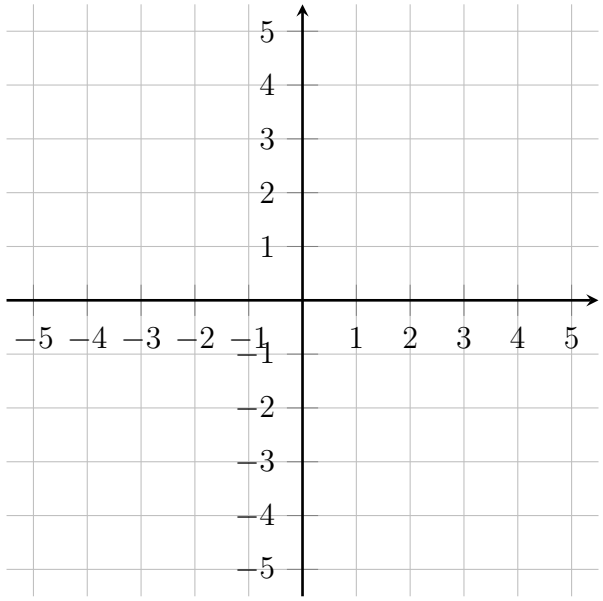
2. Graph the following function given in standard form.

$$g(x) = -x^2 - 4x - 4$$



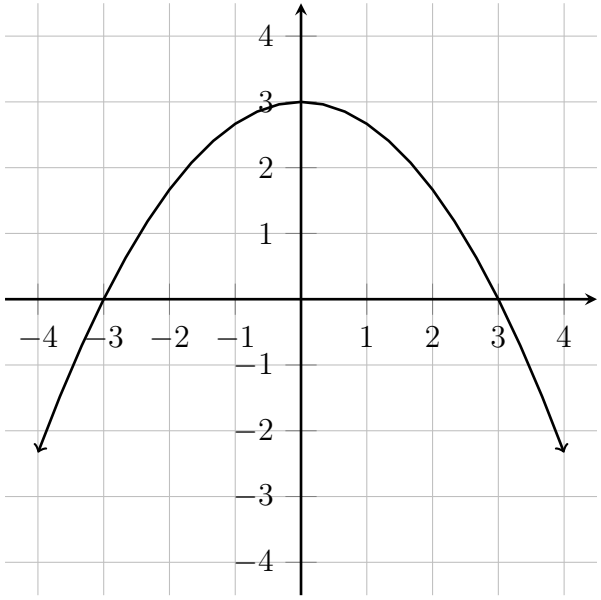
3. Graph the following function given in standard form.

$$h(x) = -2x^2 - 4x - 1$$



Now, let's move from a graph to an equation.

4. Find the standard form of the equation describing the given parabola.



Let's investigate the local extrema of quadratic functions.

5. Does a parabola have a minimum? A maximum? When? Where?

6. Does the graph of the function $f(x) = \frac{1}{2}x^2 + 6x + 2$ have a maximum or minimum?

7. Find the point where the function $f(x) = \frac{1}{2}x^2 + 6x + 2$ achieves its local extrema.

8. Does the graph of the function $a(x) = -\frac{1}{2}x^2 - 100x$ have a maximum or minimum?

9. Find the point where the function $a(x) = -\frac{1}{2}x^2 - 100x$ achieves its local extrema.