Graphing Quadratic Functions

To graph a quadratic function, you need:

- vertex \((h, k)\)
- Direction it opens
- x-intercepts (there may be one, two or none)
- y-intercept

There are two forms that a quadratic function can be in. Each has its own strength/benefit.

\[ y = a(x - h)^2 + k \]

Easy to find the vertex. Just pull out \((h, k)\).

To find x-intercepts you must set \(y\) equal to zero and then either:

1. Isolate the perfect square that contains the variable and then take the square root of both sides to solve.
2. Foil it out and then factor or use the quadratic formula to solve.

To find the y-intercept you replace \(x\) with zero and simplify.

\[ y = ax^2 + bx + c \]

Easy to find intercepts. Set \(y\) equal to zero and factor or use quadratic formula to find the x-intercepts. Then replace \(x\) with zero and simplify.

To find the vertex:

1. Use \(h = -b/2a\) to find the x-coordinate of your vertex. Then plug this x value into your function to find the y-coordinate of your vertex, \(k\). Thus:

\[
(h, k) = \left( \frac{-b}{2a}, f\left( \frac{-b}{2a} \right) \right)
\]

The direction it opens depends on the sign of \(a\), which is the coefficient of the \(x^2\) term.

- If \(a > 0\) the parabola opens up like a bowl. This is called concave up.
- If \(a < 0\) the parabola opens downward like an arch, called concave down.