How to Sketch Quadratic Equations

Lets say we have a quadratic equation in standard form $y = ax^2 + bx + c$ and we want to sketch it, then preform the following,

1. Convert y into vertex form by completing the square
   (Refer to the How to complete the square sheet if you are stuck)

2. Now you should have a new quadratic in vertex form,

$$y = a(x - h)^2 + k.$$

   Where the vertex is located at (h, k).

3. Label the vertex point on your graph.

4. **IF** $a < 0$ (a **is negative**) then draw the shape of the parabola in the downwards direction starting from the vertex.

5. **ELSE IF** $a > 0$ (a **is positive**) then draw the shape of the parabola in the upwards direction starting from the vertex.

1   Maximum's and Minimums

- **IF** $a < 0$ (a **is negative**) then we say that the vertex represents a maximum.

  - This makes sense because if $a < 0$, the parabola points down, and the highest point of the parabola must have been the vertex.

- **ELSE IF** $a > 0$ (a **is positive**) then we say that the vertex represents a minimum.

  - This makes sense because if $a > 0$, the parabola points up, and the lowest point of the parabola must have been the vertex.

Practice Problems:

Double check your answers by using the graphing website **Desmos**.(Google it)

Question 1. Sketch the following Quadratic equations. Label the $y-$intercept of each graph.

(a) $y = x^2 - x - 6$

(b) $y = -4x^2 + 7x - 12$

(c) $y = 2x^2 + 5x - 3$

(d) $y = -x^2 + 4x$

(e) $y = x^2 - 9$ (Isnt this already in vertex form?)

(f) $y = \frac{2}{3}x - \frac{5}{3}x + \frac{1}{3}$

Question 2. (Challenge) Determine the intersection point of the following two quadratic equations,

$$y = x^2 - 5x + 6$$
$$y = x^2 + x - 6.$$

(The technique is the same as in the linear case).