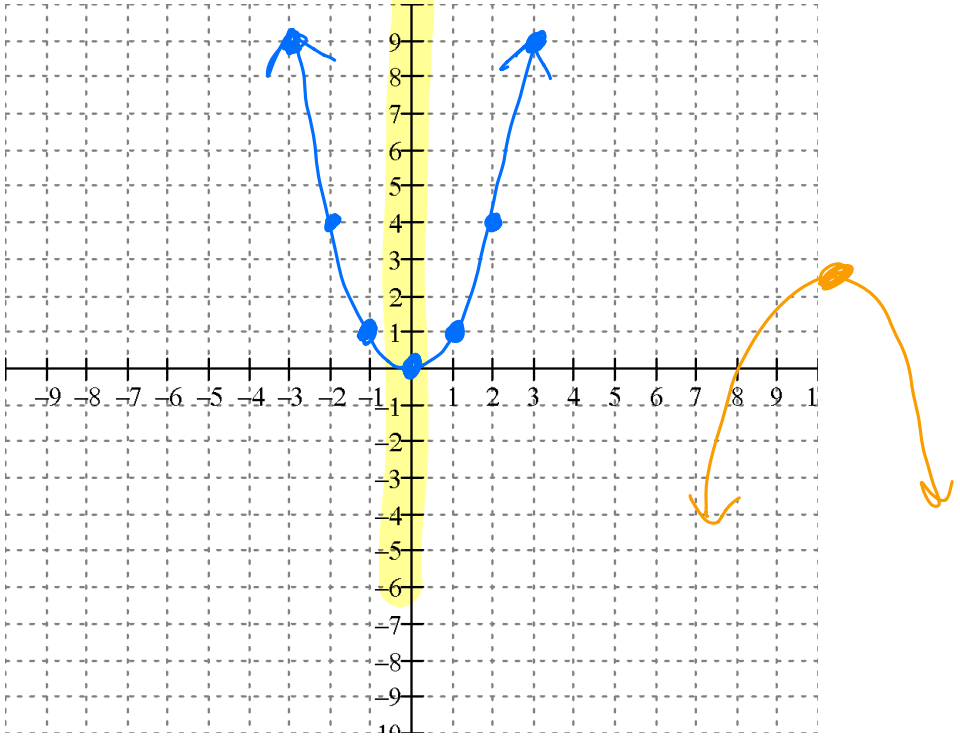
Vertex Form

A quadratic function is a polynomial of the 2nd degree.
e.g.

The graph of a quadratic is called a parabola.

Ex. #1: Sketch the graph of the curve $y = x^2$ on the grid below.

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9



The vertex of the parabola is the lowest point of the graph (if the graph opens up), and the highest point of the graph (if the graph opens down).

The y-coordinate of the vertex is called the minimum if the parabola opens upward or the maximum if the parabola opens downward.

The parabola is symmetric about a line called the axis of symmetry. This line divides the graph into two mirror images.

Investigating $y = x^2 + q$

On the grid below graph the indicated curves.

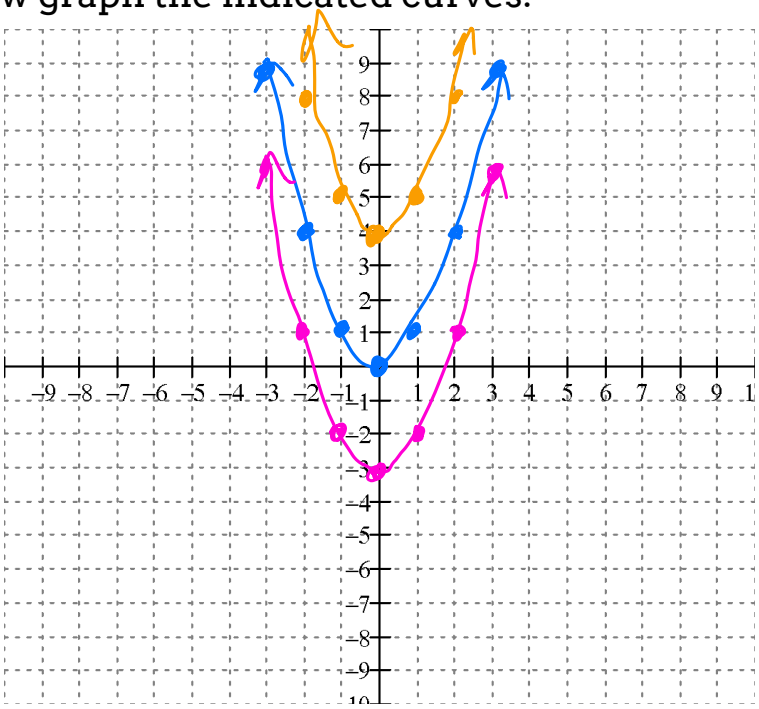
$y = x^2$

$y = x^2 + 4$

$y = x^2 - 3$

x	y
-3	13
-2	8
-1	5
0	4
1	5
2	8
3	13

x	y
-3	6
-2	1
-1	-2
0	-3
1	-2
2	1
3	6



What do you notice about the graphs? shifts up/down with ± .

In general the graph of $y = x^2 + q$ is congruent to the graph of $y = x^2$.

- If q > 0 the graph is translated q units up
- If q < 0 the graph is translated q units down

Ex. #2: Sketch the graph of $y = x^2 - 7$ on the grid below and answer the following questions.

Vertex: (0, -7)

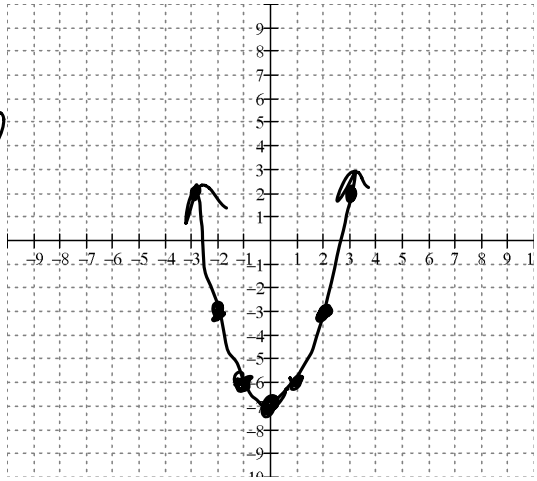
Max or Min: min

Axis of Symmetry: x = 0

Domain: _____

Range: _____

$\{y \mid y \geq -7, y \in \mathbb{R}\}$



Investigating $y = (x - p)^2$

On the grid below graph the indicated curves.

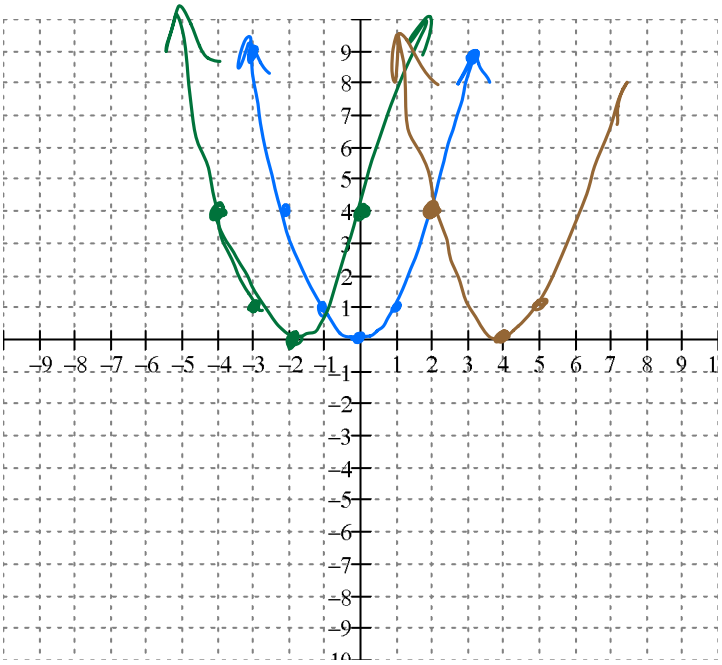
$y = x^2$

$y = (x + 2)^2$

$y = (x - 4)^2$

x	y
-4	4
-3	1
-2	0
0	4
2	16

x	y
0	16
2	4
4	0
5	1



What do you notice about the graphs? shifted left/right.

In general the graph of $y = (x - p)^2$ is congruent to the graph of $y = x^2$.

- If $p > 0$ the graph is translated p units left
- If $p < 0$ the graph is translated p units right

vertex: (4, 0)

max or min

axis of symmetry: $x = 4$

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq 0, y \in \mathbb{R}\}$

Ex. #3: Sketch the graph of the equation $y = (x + 3)^2 - 4$ by translating the graph of $y = x^2$.

Vertex: $(-3, -4)$

Max or Min: _____

Axis of Symmetry: $x = -3$

Domain: $\{x \mid x \in \mathbb{R}\}$

Range: $\{y \mid y \geq -4, y \in \mathbb{R}\}$