Vertex Form

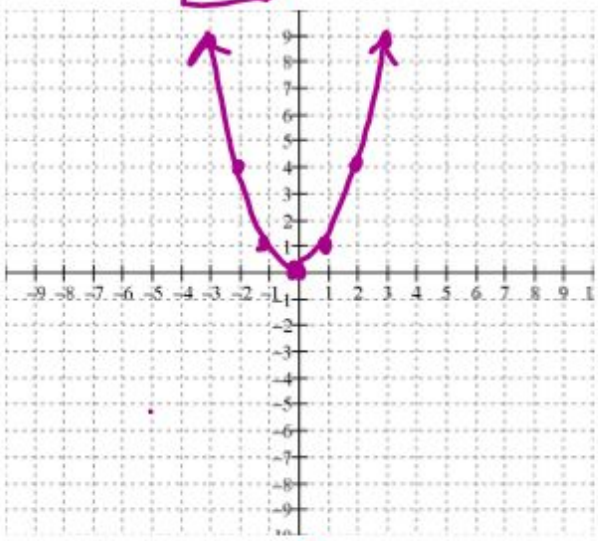
A quadratic function is a polynomial of the 2nd degree.
e.g.

The graph of a quadratic is called a parabola

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

$y = x^2$

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

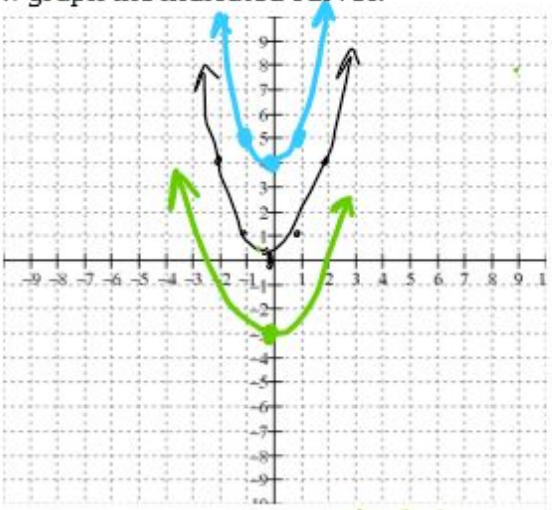
Investigating $y = x^2 + q$

On the grid below graph the indicated curves.

- $y = x^2$
- $y = x^2 + 4$
- $y = x^2 - 3$

x	y
0	4
-1	1

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



What do you notice about the graphs? same shape → shifted up/down

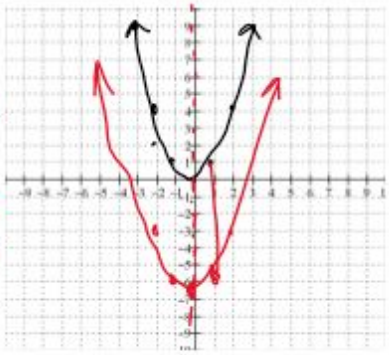
In general the graph of $y = x^2 + q$ is congruent to the graph of $y = x^2$.

- 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: -7
Axis of Symmetry: $x = 0$
Domain: $\{x \mid x \in \mathbb{R}\}$
Range: $\{y \mid y \geq -7, y \in \mathbb{R}\}$

x such that x exists within the set of rational #s.



Investigating $y = (x - p)^2$
On the grid below graph the indicated curves.

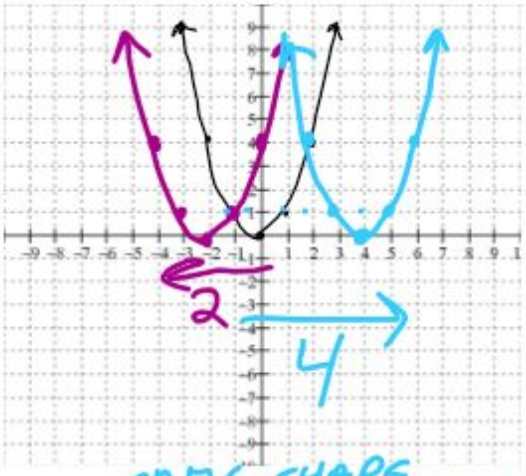
$y = x^2$

$y = (x + 2)^2$

$y = (x - 4)^2$

x	y
0	4
-1	1
-2	0

x	y



What do you notice about the graphs? SAME SHAPE SHIFTED LEFT/RIGHT

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

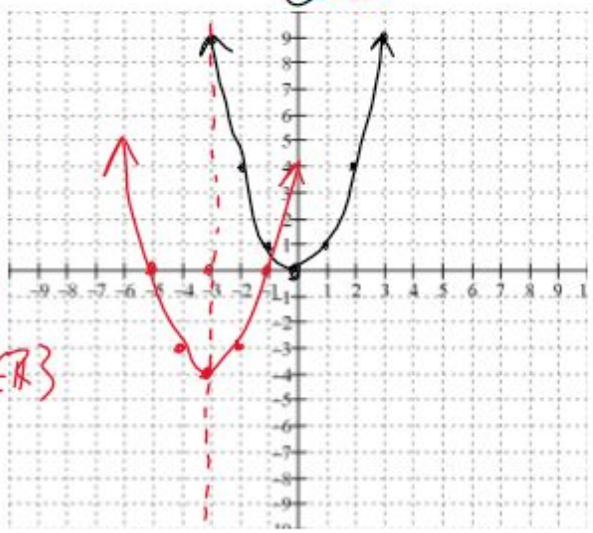
- If p > 0 the graph is translated p units right
- If p < 0 the graph is translated p units left.

$x = 1 \quad y = A(x - p)^2 + q$

if $p = 3 \quad y = (x - 3)^2 + q$

if $p = -3 \quad y = (x + 3)^2 + q$

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: $y=-4$

Axis of Symmetry: $x=-3$

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

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

Pg 157
#2, 3a, 7b, 8d