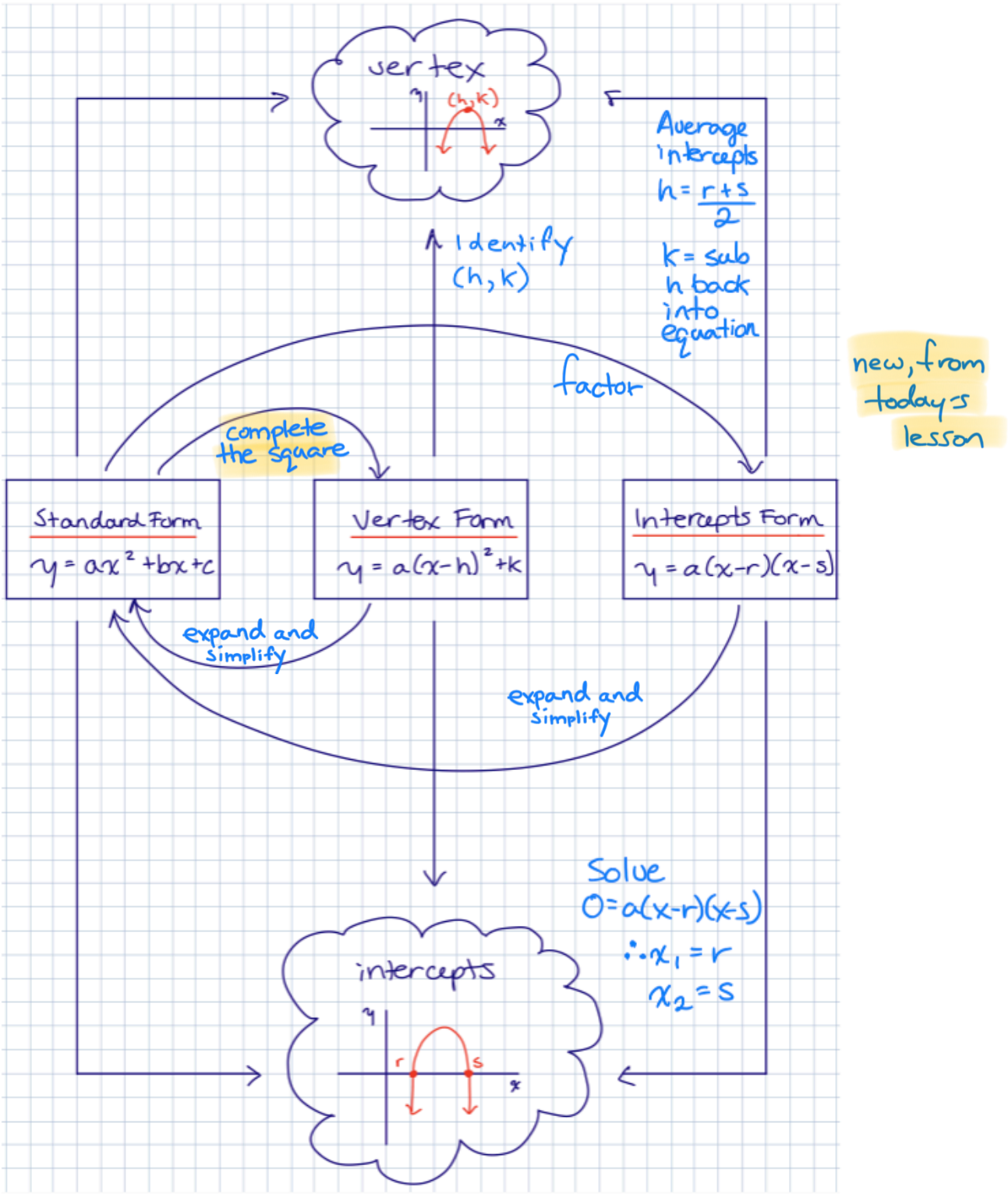
Standard Form to Vertex Form

Quadratic Relations Concept Map



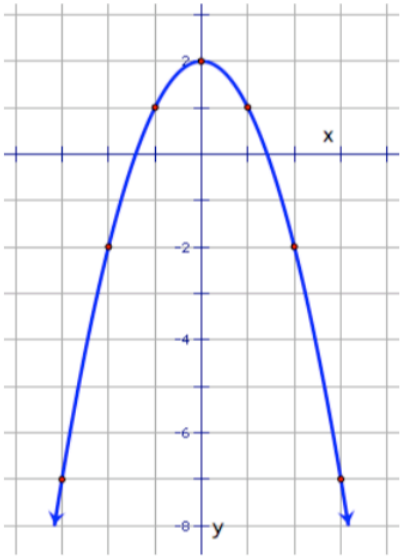
Looking Back

Aside from using words, there are three other representations, or ways, to consider a quadratic relation:

Using symbols (algebra) As a table As a graph

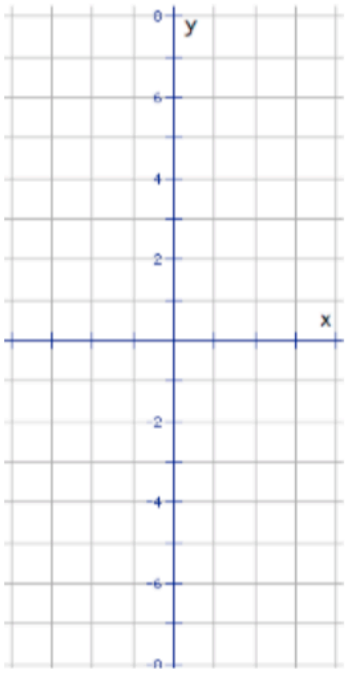
$y = -x^2 + 2$

x	y
-3	-7
-2	-2
-1	1
0	2
1	1
2	-2
3	-7

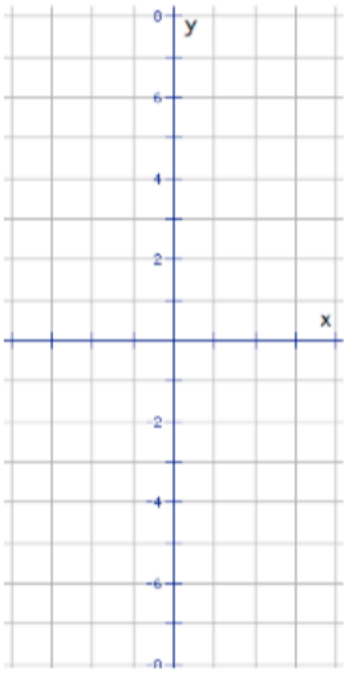


Practice Three quadratic relations are listed below in symbolic form. Write each in graphical form (ie. draw the graph).

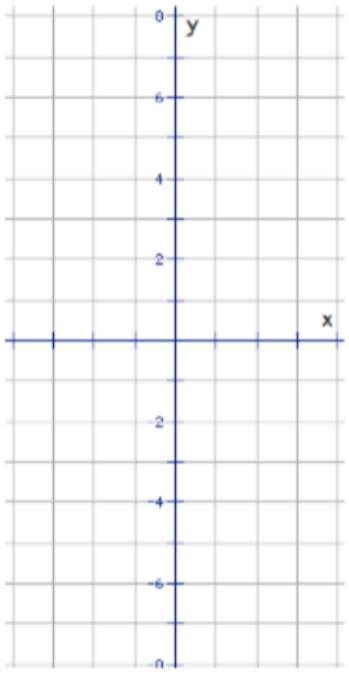
$y = -x^2 + 3$



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



$y = x^2 + 4x + 5$



Graphing the third relation may have proven a challenge.

Although it is a quadratic relation (it contains an x^2 term) it is not written in the form:

$y = a(x-h)^2 + k$ … which makes it convenient to graph and analyze.

Completing the Square

We use a method called "completing the square" when given a quadratic relation in the form:

$y = ax^2 + bx + c$ ... to re-write the quadratic relation in the form:

$y = a(x-h)^2 + k$ … which is convenient for graphing and analyzing.

How to Complete the Square

To convert a quadratic relation in the form $y = ax^2 + bx + c$ to the form $y = a(x-h)^2 + k$ … follow these steps:

$y = x^2 + 6x + 7$

$y = x^2 + 6x + 9 - 9 + 7$ Add and subtract the square of half the co-efficient of x

$y = (x^2 + 6x + 9) - 9 + 7$ Group the perfect square trinomial.

$y = (x+3)^2 - 9 + 7$ Factor the perfect square trinomial (write as square of a binomial).

$y = (x+3)^2 - 2$ Simplify outside the brackets.

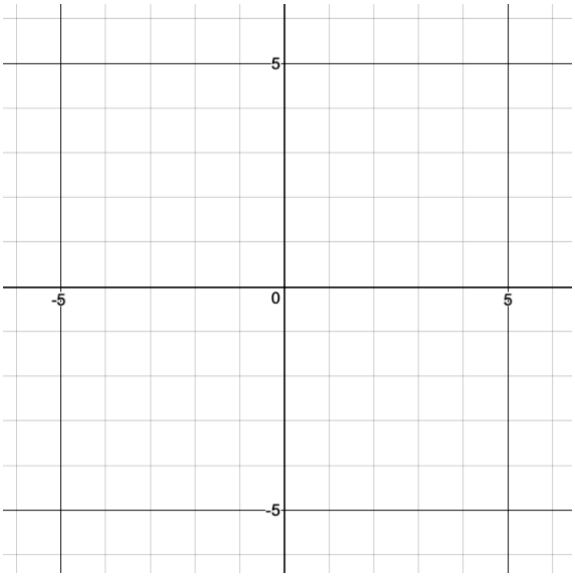
Equivalent Algebraic Expressions

So the expression $y = x^2 + 6x + 7$ can also be written as $y = (x+3)^2 - 2$?

Really?

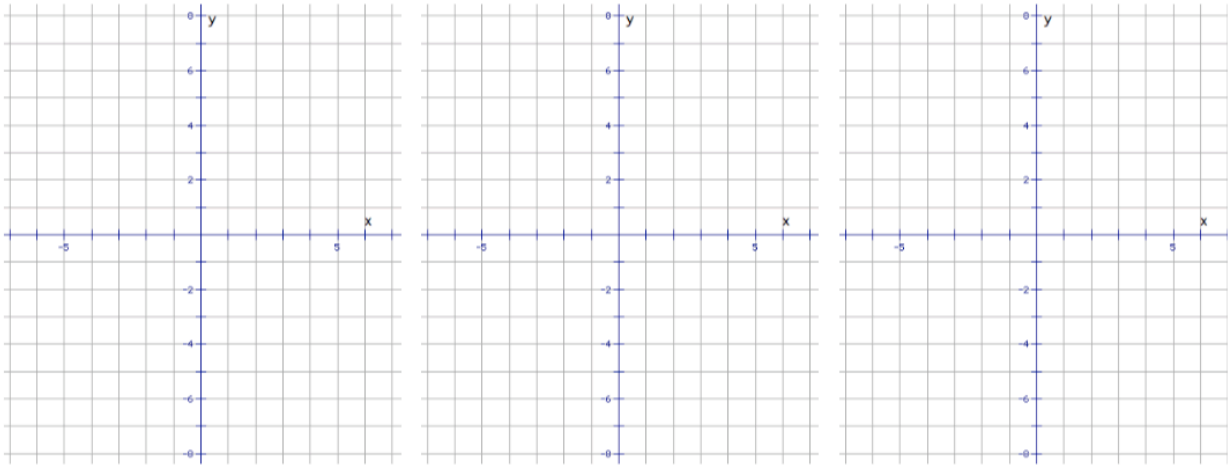
Are the two relations equivalent?

Let's check using Desmos to graph each relation.



Example 1 Write each relation in the form $y = a(x-h)^2 + k$. State the maximum or minimum point. Then, sketch the graph of each relation.

a) $y = x^2 + 4x + 7$ b) $y = x^2 - 10x + 24$ c) $y = -x^2 - 6x - 8$



Opportunity to Learn

Complete all questions in the provided handout that accompanies this lesson.