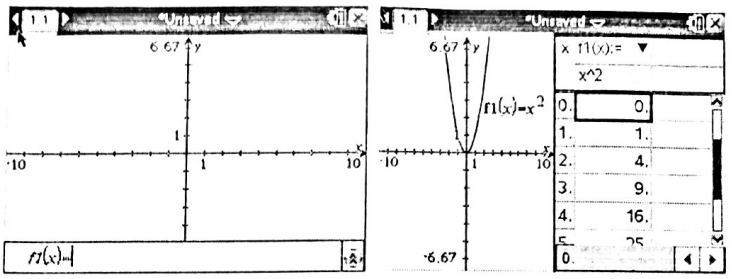
The Vertex Form of a Quadratic Relation | MFM2P

In this investigation we will combine transformations "Basic Parabola" we talked about last day.

TECHNOLOGY OPTION
If you are using a TI-nspire, add a new "Graph Document" and enter your relation. You can bring up a table of values by pressing "ctrl" then "T".



Complete the following tables fully, describing the transformations that each graph undergoes from the basic parabola $y = x^2$.

Mr. Smith will do the first one with you:

Relation #1: $y = (x-2)^2 - 3$

x	y
-1	6
0	1
1	-2
2	-3
3	-2
4	1
5	6

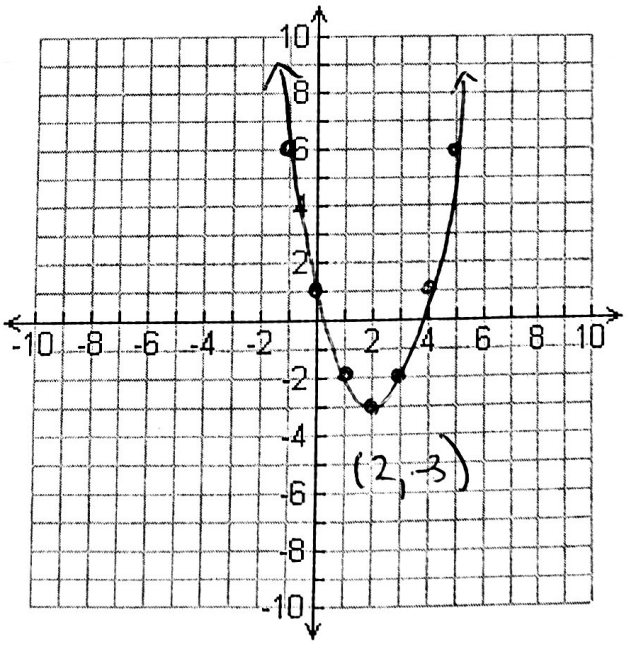
Vertex: (2, -3)

Step Pattern: 1, 3, 5

Vertical Shift? ↓3

Horizontal Shift? → 2

Graph:



Relation #2: $y = 0.5(x+2)^2 + 4$

x	y
-5	8.5
-4	6
-3	4.5
-2	4
-1	4.5
0	6
1	8.5

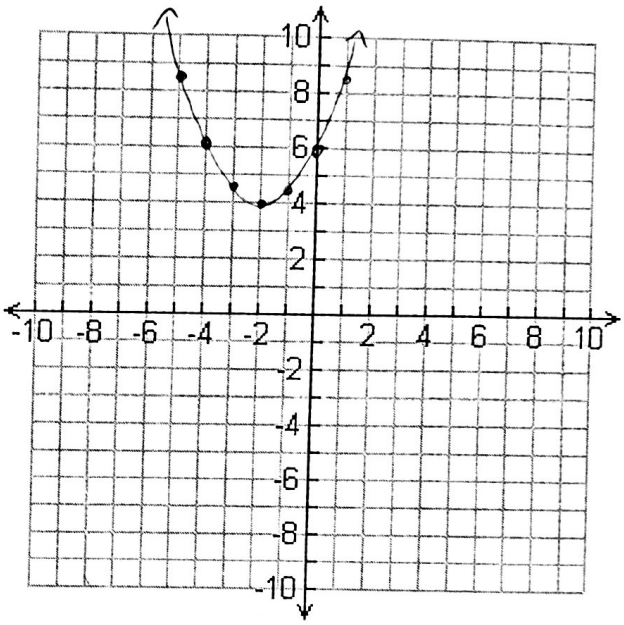
Vertex: (-2, 4)

Step Pattern: 0.5, 1.5, 2.5

Vertical Shift? 2 ←

Horizontal Shift? ↑ 4

Graph:



Relation #1: $y = -2(x+1)^2 + 5$

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

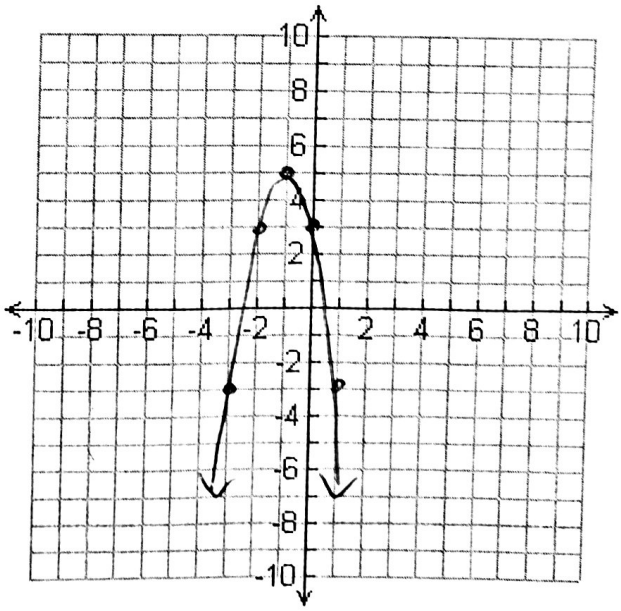
Vertex: (-1, 5)

Step Pattern: -2, -6, -10

Vertical Shift? ↑ 5

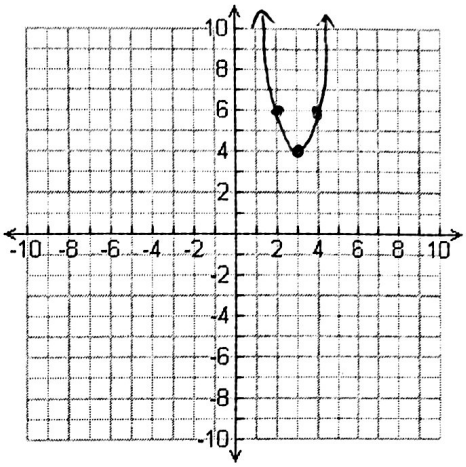
Horizontal Shift? ← 1

Graph:



We would like to be able to sketch quadratic relations without using technology. Consider the following quadratic relation as we describe the transformations that would occur, and then determine the vertex and the step pattern.

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



Transformations:

- shifts up 4
- shifts right 3
- step pattern is 2(1, 3, 5)

Vertex:	(3, 4)	Step Pattern:	2, 6, 10

The **vertex form** of a quadratic relation is given by:

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

Where: k tells you....

- the vertical shift
- the y-value of the vertex

h tells you...

- the horizontal shift
- the x-value of the vertex

switch

Vertex (h, k)

a tells you...

- the step pattern → a(1, 3, 5)

Vertex Form of a Quadratic Relation | MFM2P

In order to make a sketch of a quadratic relation in vertex form, you just need to follow two steps:

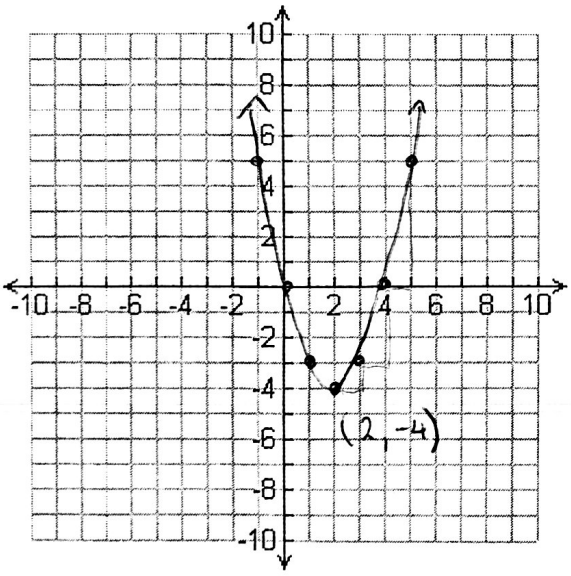
1) Write down the vertex, and then plot it.
2) Write down the step pattern, and use it to draw the rest of the graph.

Using your knowledge of transformations, graph the following quadratic relations.

a) $y=(x-2)^2-4$ switch the x

Vertex: (2, -4)

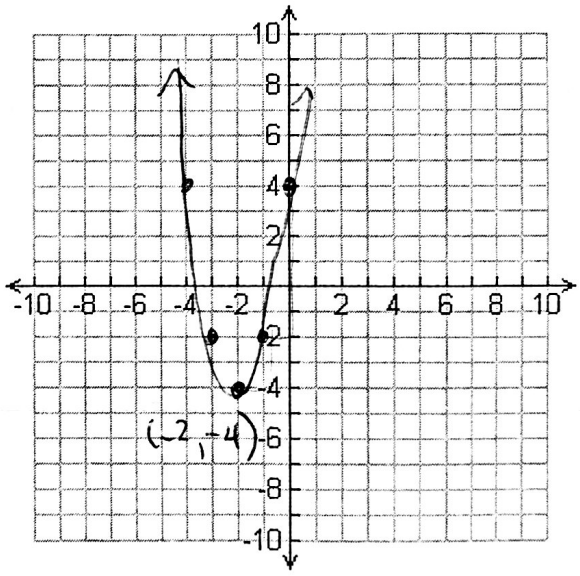
Step Pattern: 1, 3, 5



b) $y=2(x+2)^2-4$ switch the x

Vertex: (-2, -4)

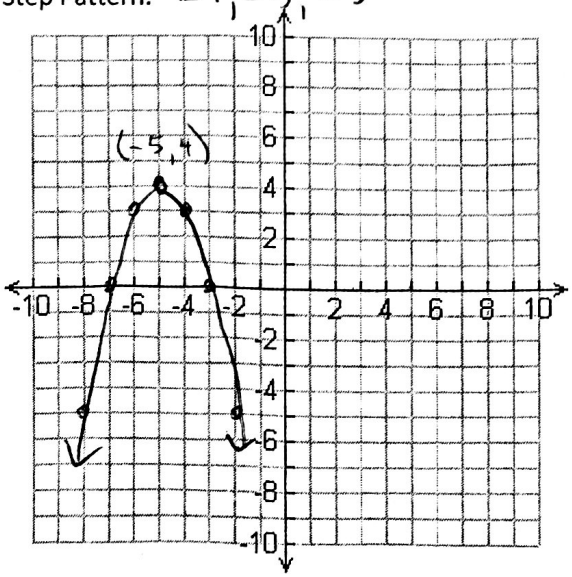
Step Pattern: 2(1, 3, 5) = 2, 6, 10



c) $y=-(x+5)^2+4$

Vertex: (-5, 4)

Step Pattern: -1, -3, -5



d) $y=2(x-5)^2-6$

Vertex: (5, -6)

Step Pattern: 2, 6, 10