Steps to Transform a Simple Parabolic Graph

Given the equation $y=-\frac{1}{4}(x-2)^2+4$, how can you figure out what the graph looks like without calculating and plotting a bunch of points?

Step 1

First, determine what simple graph this would be similar to. Since we know we are working with a parabolic graph, it looks like $y=x^2$. (Why? Because the x term – the part within the parentheses – is squared.) If you don't know what this graph looks like, you should graph it.

x	**$y=x^2$**

Step 3

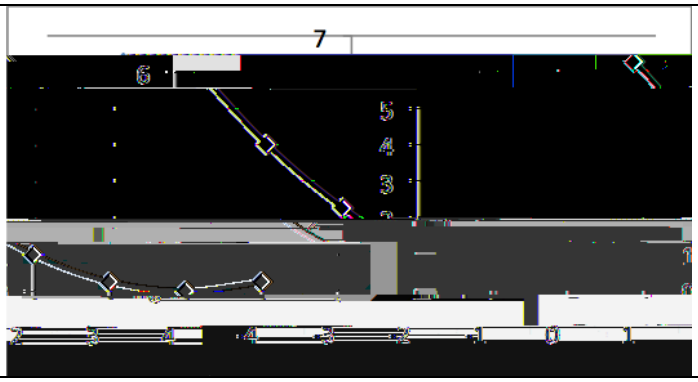
Shift the graph horizontally

$$y=-1\ (¼)\ (x-2)^2+4$$

A number added to or subtracted from the x term shifts the graph left or right. So, to tackle this step, we are going to make the change highlighted above to our graph of $y=x^2$. This gives us:

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

x	$y=¼(x-2)^2$
3	¼
2	0
1	¼
0	1
-1	2¼
-2	4
-3	6¼



Notice that the graph from Step 3 passed through (-3,25) but now passes through (-3,6¼). 6¼ is one quarter of 25. The graph has been compressed to one quarter of its previous vertical span.

Step 5

Reflect the graph (change values from negative to positive)

$$y=-1\ (¼)\ (x-2)^2+4$$

If there is a negative sign leading the equation, this will change the x value from positive to negative, which turns the graph upside down, reflecting it around the x axis.

$$y= -1(¼)(x-2)^2$$

How we got here: $y=x^2$

Step 6

Shift the graph up or down

$$y=-1\ (¼)\ (x-2)^2+4$$

A number added after the x value (but outside the parentheses) either shifts the graph upward (if positive) or downward (if negative).

$$y= -1(¼)(x-2)^2+4$$

How we got here: $y=x^2$ → $y=(x-2)^2$ → $y= ¼\ (x-2)^2$ → $y= -1(¼)(x-2)$