

Graphing Quadratics Using Transformational Form

- As we've seen, when graphing functions in transformational form, we can use its different components to create a mapping rule and generate a table of values for the function and then graph it. This is called the Mapping Rule Method.
- Now, let's put the various transformational components together to graph a quadratic function.
- Step 1: Identify the three main transformations of the equation (HT, VS, VT).

The transformational form of an equation is of the form:

$$\frac{1}{a}(y - k) = (x - h)^2$$

where: a = vertical stretch (VS)
 k = vertical translation (VT) up or down and
 vertex = (h ,k)
 h =horizontal translation (HT) left or right

It may be easier to remember the formula if we write it as:

$$\frac{1}{vs}(y - vt) = (x - ht)^2$$

Notice that the vertical components are on the "y-side" of the equation and the horizontal components are on the "x-side".

- Step 2: Write the mapping rule for the given function.

The resulting mapping rule from the equation is of the form:

$$(x, y) \rightarrow (x + h, ay + k)$$

or

$$(x, y) \rightarrow (x + HT, VSy + VT)$$

- Step 3: Create a new table of values for the given function.

This mapping rule is then applied to the table of values for the base parabola $y = x^2$ to create a new table of values for the desired function.

- Step 4: Graph the function using the new table of values generated with the mapping rule.
- Example:

Sketch the graph of the function $-\frac{1}{3}(y - 4) = (x + 3)^2$ using the Mapping Rule Method.

Solution:

Step 1: Identify the three main transformations of the equation (HT, VS, VT).

$$\text{HT} = -3 \quad \text{VT} = 4 \quad \text{VS} = 3$$

Step 2: Write the mapping rule for the given function.

The mapping rule is: $(x, y) \rightarrow (x - 3, -3y + 4)$

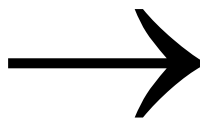
Step 3: Create a new table of values for the given function.

The standard base table of values for

$$y = x^2:$$

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

$$(x, y) \rightarrow (x - 3, -3y + 4)$$



The newly generated table of values for

$$-\frac{1}{3}(y - 4) = (x + 3)^2:$$

x	y
-6	-23
-5	-8
-4	1
-3	4
-2	1
-1	-8
0	-23

Step 4: Graph the function using the new table of values generated with the mapping rule.

