

Algebra 1 9.3

Apply transformations to quadratic functions
Apply dilations and reflections to quadratic functions

parent graph

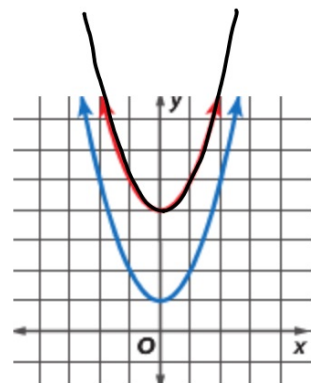
transformation

translation slides

reflection flip

dilation enlarge/reduce

parent graph $y = x^2$
 $y = 1x^2 + 0x + 0$
 $a=1$ $b=0$ $c=0$



Are these the same shape?

$$x = -\frac{b}{2a} = -\frac{0}{2} = 0$$

Parent graph

$$f(x) = x^2$$

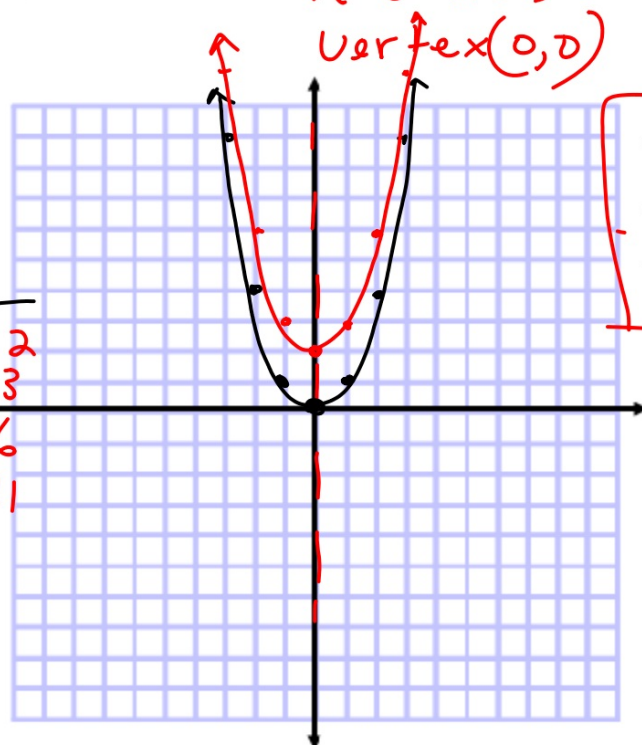
in words: $x \cdot x$

in symbols:

	$x \cdot x$	
0	0 · 0	0
1	1 · 1	1
2	2 · 2	4
3	3 · 3	9

$$y = x^2 + 2$$

$x=0$ Axis
Vertex(0,0)



$$1^2 = 1$$

$$2^2 = 4$$

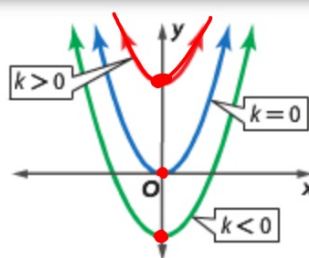
$$3^2 = 9$$

KeyConcept Vertical Translations

The graph of $f(x) = x^2 + k$ is the graph of $f(x) = x^2$ translated vertically.

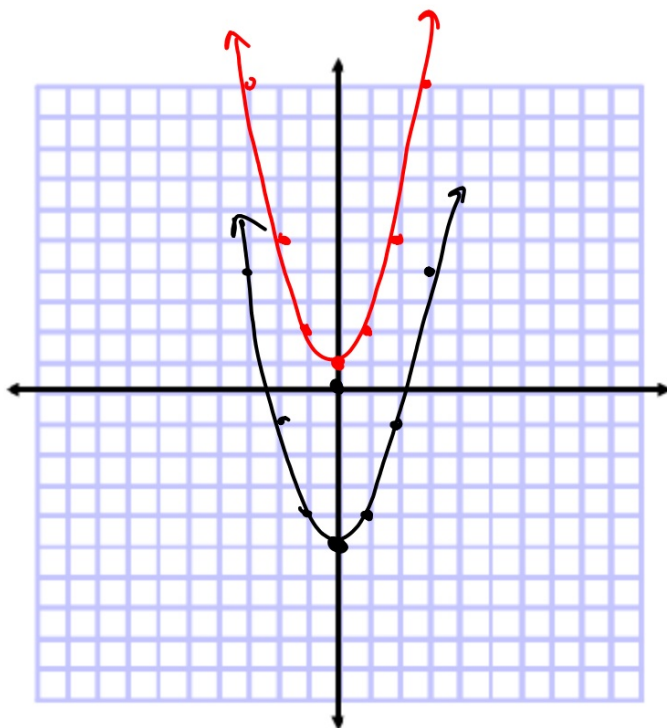
If $k > 0$, the graph of $f(x) = x^2$ is translated $|k|$ units **up**.

If $k < 0$, the graph of $f(x) = x^2$ is translated $|k|$ units **down**.



1C. $h(x) = -5 + x^2$

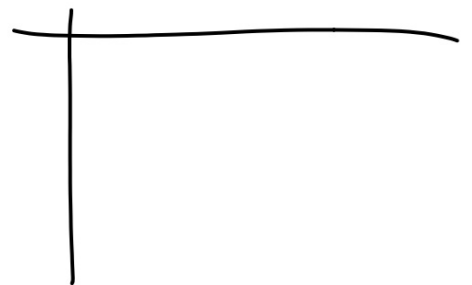
1D. $f(x) = x^2 + \underline{\underline{1}}$



$f(x)$

$h(x) = x^2 - 5$

$f(x) = (x+3)^2 + 5$



Notice the subtraction in the formula...
(related to the distance formula...trust me)

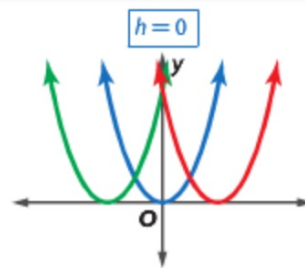
A quadratic graph can be translated horizontally by subtracting an h term from x .

KeyConcept Horizontal Translations

The graph of $g(x) = (x - h)^2$ is the graph of $f(x) = x^2$ translated horizontally.

$$x - 3 \quad (3 \text{ r.t.})$$

$$x + 2 \quad (2 \text{ left})$$



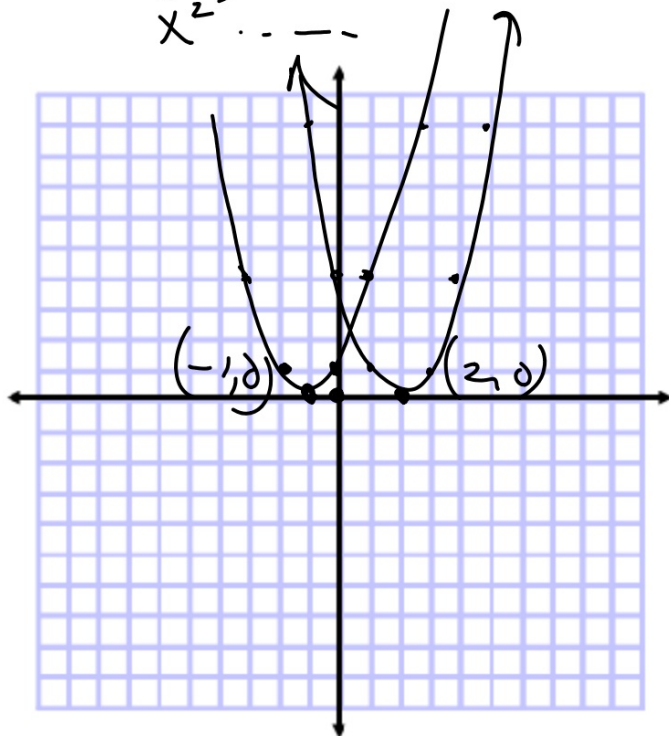
Remember the - in the formula? What did you subtract?
in words:

Example 2 Horizontal Translations

Describe how the graph of each function is related to the graph of $f(x) = x^2$.

a. $g(x) = (x - 2)^2 + 0$

b. $g(x) = (x + 1)^2 + 3$



x^2 — $(x + 1)^2$
 $x - 1$

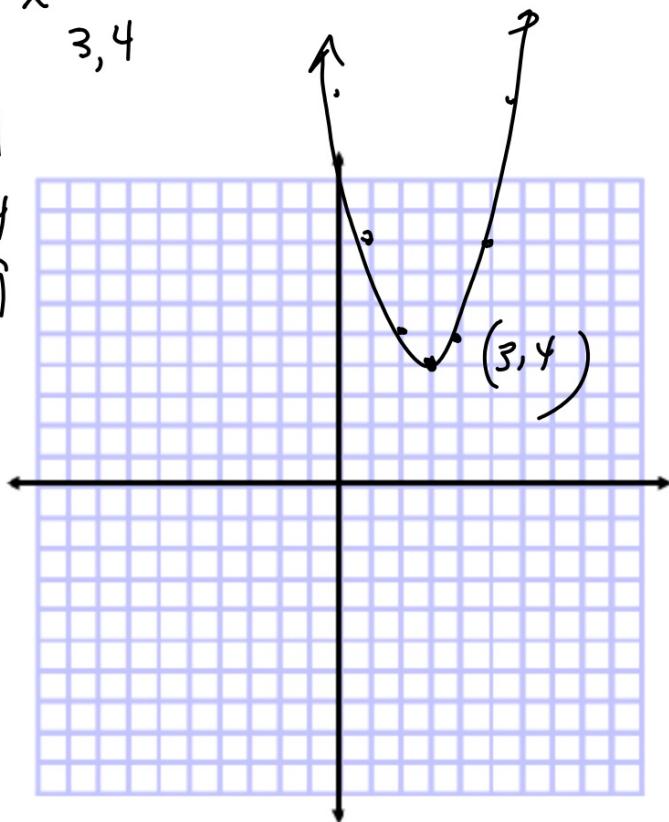
in words:

Guided Practice

2A. $g(x) = (x - 3)^2 + 4$
 x^2
3, 4

2B. $g(x) = (x + 2)^2$

$1^2 = 1$
 $2^2 = 4$
 $3^2 = 9$



in words:



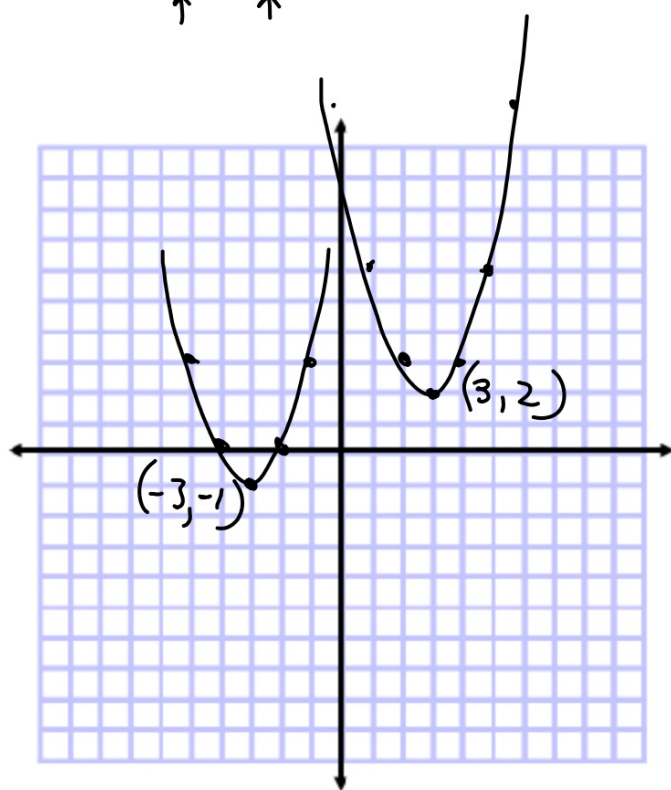
Example 3 Horizontal and Vertical Translations

Describe how the graph of each function is related to the graph of $f(x) = x^2$.

a. $g(x) = (x - 3)^2 + 2$



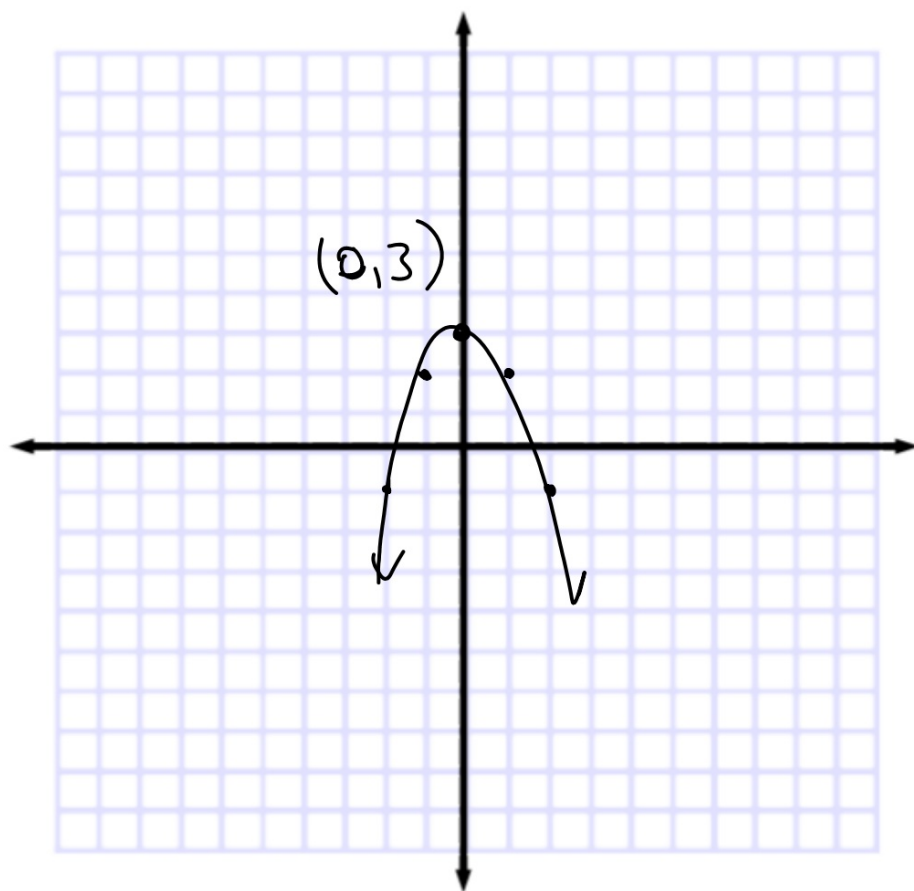
b. $g(x) = (x + 3)^2 - 1$



Parent graph
(TOV)

$$x^2 \dots$$

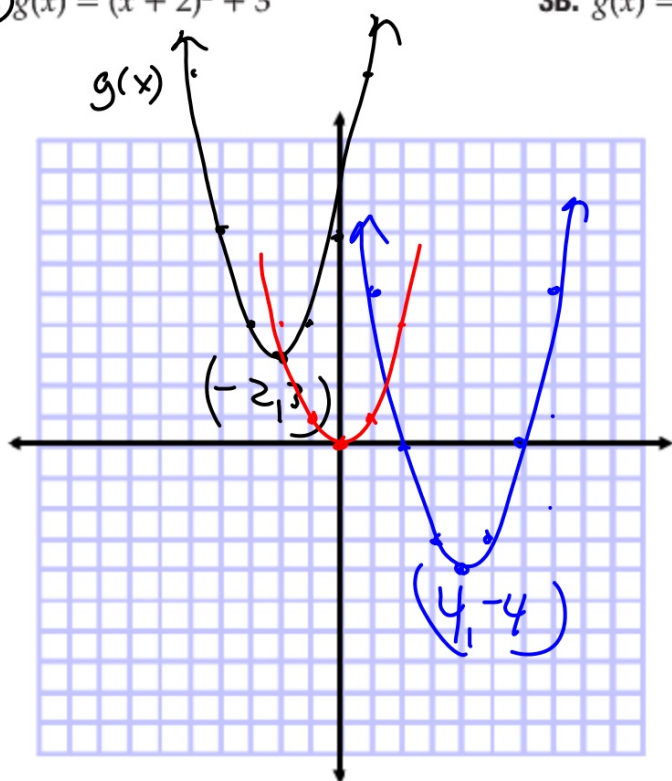
$$y = -x^2 + 3$$



Graph from parent graph:

Guided Practice

3A. $g(x) = (x + 2)^2 + 3$



3B. $g(x) = (x - 4)^2 - 4$



~~9-33 odd~~

~~25~~ ~~27~~ p. 569

1, 3, 4, 6, 9
19, 21, 23, 33

