A **quadratic function** is a function that can be written in the form

$$f(x) = a(x-h)^2 + k \qquad (a \neq 0)$$

Linear and Quadratic Parent Functions

ALGEBRA	NUMBERS						GRAPH

Linear Parent Function
$f(x) = x$

x	−2	−1	0	1	2
$f(x) = x$	−2	−1	0	1	2

Quadratic Parent Function
$f(x) = x^2$

x	−2	−1	0	1	2
$f(x) = x^2$	4	1	0	1	4

Vertex form:

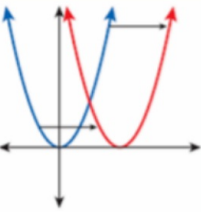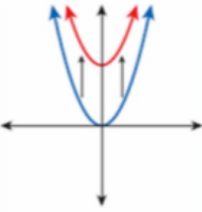Vertex Form of a Quadratic Function

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

a indicates a reflection across the *x*-axis and/or a vertical stretch or compression.

h indicates a horizontal translation.

k indicates a vertical translation.

Coordinates of vertex in vertex form: (h, k)

Translations of Quadratic Functions	
Horizontal Translations	Vertical Translations
Horizontal Shift of $|h|$ Units	Vertical Shift of $|k|$ Units

<table>
<tr><td>

$f(x) = x^2$
$f(x - h) = (x - h)^2$
Moves left for
$h < 0$
Moves right for
$h > 0$

$x \leftarrow h$

</td><td>

$f(x) = x^2$
$f(x) + k = x^2 + k$
Moves down for $k < 0$
Moves up for $k > 0$

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</table>

Ex. Using the graph of $f(x) = x^2$ as a guide, describe the transformations, and then graph each function.
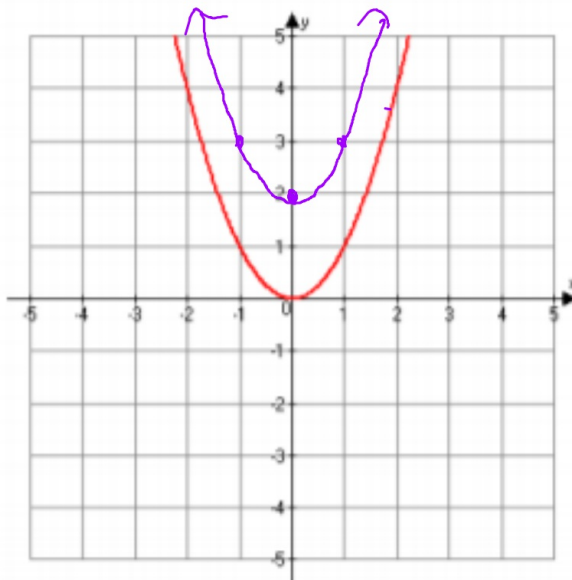
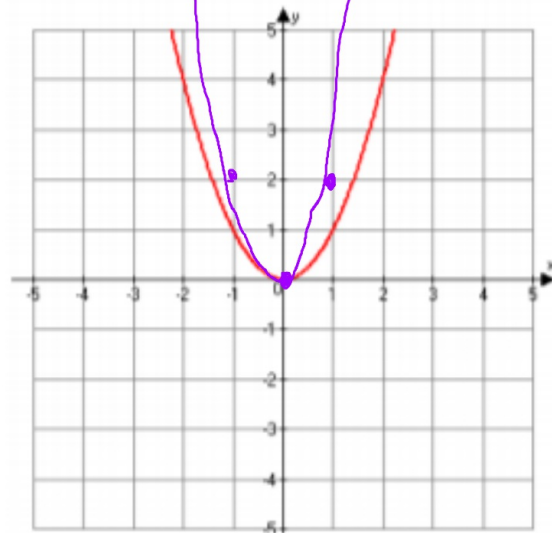a. $g(x) = (x+3)^2 + 1$ left 3
   up 1

b. $g(x) = (x-2)^2 - 1$ right 2
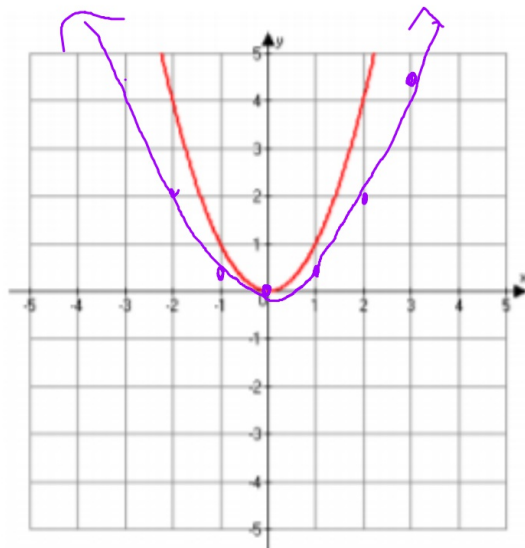   down 1

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

$f(x) = 2x^2$
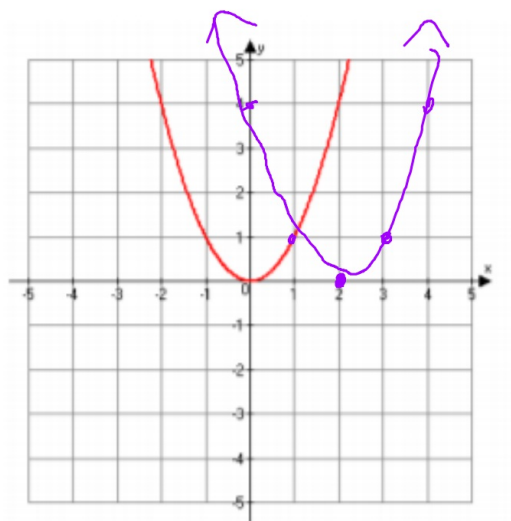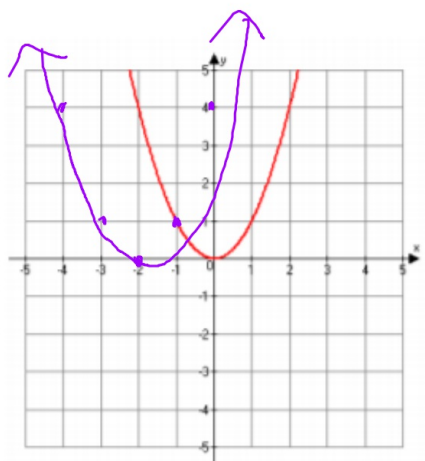

$f(x) = \dfrac{1}{2}x^2$

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

x^2

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

Name ALL the transformations from the parent function $f(x) = x^2$

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

vertically stretch by 2
reflect the parabola
left 1 unit
down 1 unit