Algebra 1: 11.7 Guided Notes **Name** ________________________________ **Period** _______

Transformations of Quadratic Functions

Transform means to change.

Transformations change the basic quadratic function, $y = x^2$, into other quadratic functions by:

1) Moving (or translating) the graph
2) Flipping (or reflecting) the graph
3) Stretching or shrinking (or dilating) the graph

Moving or Translating the Graph

$f(x) = x^2 + k$ $\Rightarrow$ the graph is **vertically translated** by k units.

If $k > 0$, the graph moves UP k units.

If $k < 0$, the graph moves DOWN k units.

$f(x) = (x \pm h)^2$ $\Rightarrow$ the graph is **horizontally translated** by h units.

$(x - h)$ means the graph moves to the RIGHT h units.

$(x + h)$ means the graph moves to the LEFT h units.

Flipping or Reflecting the Graph

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

The graph is reflected over the X-AXIS.

The parabola looks like it is flipped upside down.

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

The graph is reflected over the Y-AXIS.

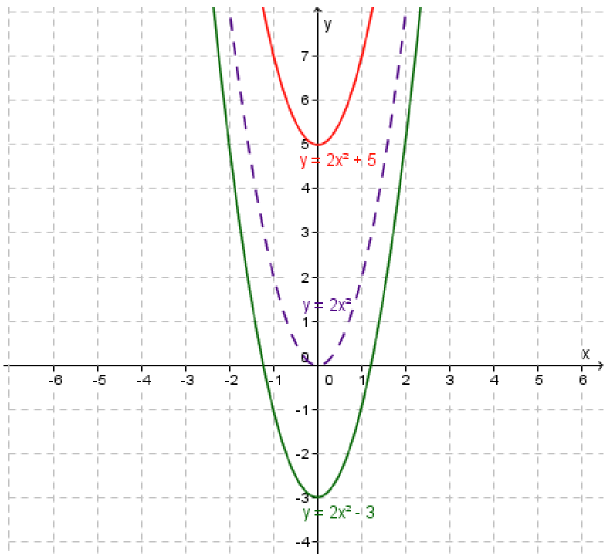
It produces the same graph as $f(x) = x^2$. The function does not change since squared values are always positive.

Dilating the Graph

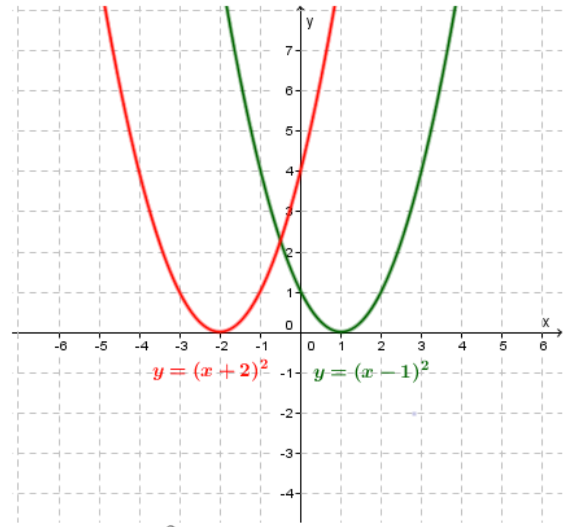
$f(x) = ax^2$ $\Rightarrow$ the graph is **dilated vertically** by a factor of a.

If $a > 1$, the graph is stretched or becomes narrower by a dilation factor of a.

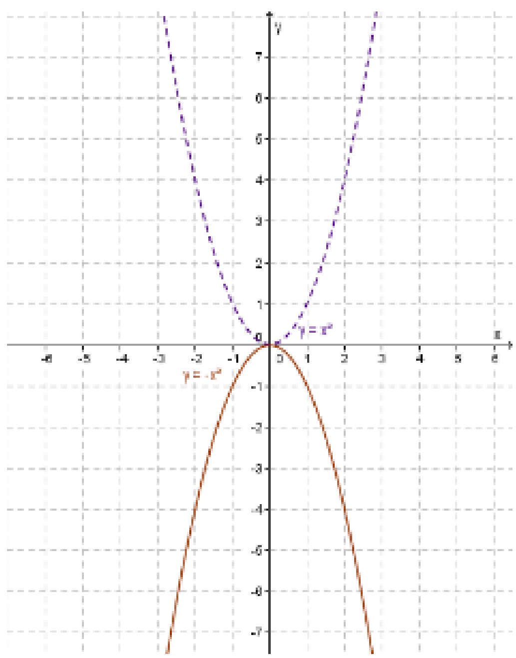
If $0 < a < 1$, the graph is shrunk or becomes wider by a dilation factor of a.



Vertical translation.

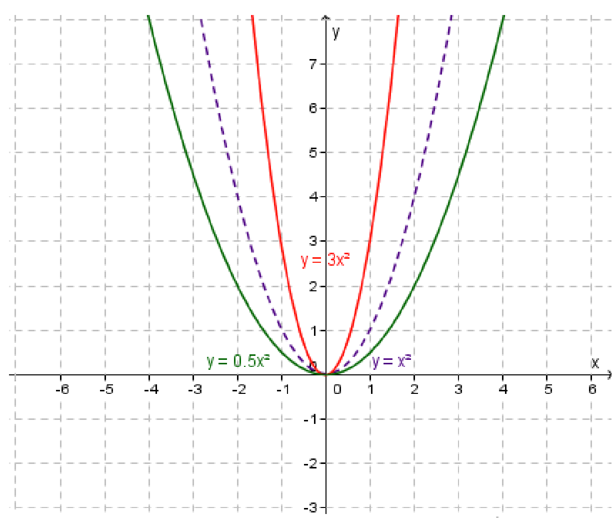


The graph $y = x^2$ being horizontally translated 2 units left to $y = (x+2)^2$ and 1 unit right to $y = (x-1)^2$



Shows the reflection of

$y = x^2$ to $y = -x^2$



Dilation of $y = x^2$ to $y = 3x^2$ and $y = \frac{1}{2}x^2$