Notes for Quadratic Transformations

Quadratic Parent Function: \( y = x^2 \)

![Vertex at (0, 0)](image)

Vertex Form of a Quadratic and Transformations:

\[
y = a(x + h)^2 + k
\]

**a:** If \( a \) is _____________, it opens _____________.
If \( a \) is _____________, it opens _____________.
(Note: Absolute Value, \(|a|\), is the distance from 0 on a number line.
\(|3| = 3\) and \(|-3| = 3\)
Basically, ignore the signs.)
If \(|a| > 1\), it is _____________ than \( y = x^2 \).
If \(|a| < 1\), it is _____________ than \( y = x^2 \).

**h:** Since \( h \) is inside the parenthesis with \( x \), it changes the ___ value of the vertex
(shifts it ___________ or ____________).
If \(+h\), the graph shifts _______________.
If \(-h\), the graph shifts _______________.

**k:** Since \( k \) is outside the parenthesis
(not with \( x \)), it changes the ___ value of the vertex (shifts it ______ or ________).
If \(+k\), the graph shifts _______________.
If \(-k\), the graph shifts _______________.

The Vertex of \( y = a(x + h)^2 + k \) is \((-h, k)\).

The opposite of \( h \)

---

Examples and Practice:

Compare each to the quadratic parent function \( y = x^2 \).

1. \( y = -x^2 + 2 \)

You can look at the two functions in the calculator.

2. \( y = 2(x + 4)^2 \)

3. \( y = \frac{1}{2}(x + 7)^2 + 3 \)

4. \( y = -3(x - 2)^2 - 6 \)