Quadratics in Vertex Form:

Transformations

A quadratic can be written in many forms:

- Vertex Form: $y = a(x-h)^2 + k$
- Factor Form: $y = a(x-b)(x-c)$
- Transformation Form: $y = a(bx-c) + d$
- Standard Form: $y = ax^2 + bx + c$

This station will focus on quadratic transformations in vertex form. Recall quadratic transformation form $\boldsymbol{y = a(bx-c)^2 + d}$. Quadratic vertex form, $\boldsymbol{y = a(x-h)^2 + k}$ can be used to describe the same graphical transformations. *Note: for this station, assume $\boldsymbol{b = 1}$.

The parameter **a** causes the graph of a function to be reflected across the **x-axis** of the coordinate plane.

- When **a < 0** (negative), the graph is **reflected across the x-axis** (vertical reflection) https://www.desmos.com/calculator/yvtgm6i9fu

The parameter **a** also causes the graph to stretch or shrink vertically. The sign **does not** affect dilations, so you will look at values of **|a|**, ignoring the sign of a.

- When **|a| > 1**, the graph experiences a **vertical expansion** (stretch). When **0 < |a| < 1** (values between zero and one), the graph experiences a **vertical compression** (shrink). https://www.desmos.com/calculator/sufxvne9ho

The parameters **h** and **k** cause the **vertex** of a function to be shifted up, down, left, or right. The vertex can be referred to by

- When **d > 0**, the graph experiences a **vertical shift up** by **d** units. When **d < 0**, the graph experiences a **vertical shift down** by **d** units. https://www.desmos.com/calculator/vw4iclowsj
- When **c > 0** , the graph experiences a horizontal shift **left** by **c** units. When **c < 0**, the graph experiences a horizontal shift **right** by **c** units. https://www.desmos.com/calculator/yslbbavg1f