Module 4: Lesson 21

# Graphing Quadratics using Transformations from the Parent Function, $f(x)=x^2$

By using transformations we can graph quadratics by identifying the key features from vertex form (the values for "a", "h", and "k"). This allows us to graph without having to create a table of values.

Vertex form

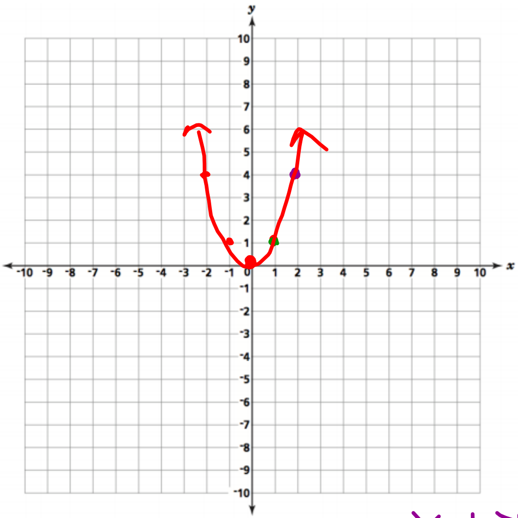
$$f(x)=a(x-h)^2+k$$

"h" indicates a horizontal translation (opposite direction)

"k" indicates a vertical translation (same direction)

"a" indicates if the graph will stretch, compress, and reflect.

Graph the function, $g(x) = -3(x-2)^2 + 5$



1. Start by graphing the parent function, $\boxed{f(x) = x^2}$

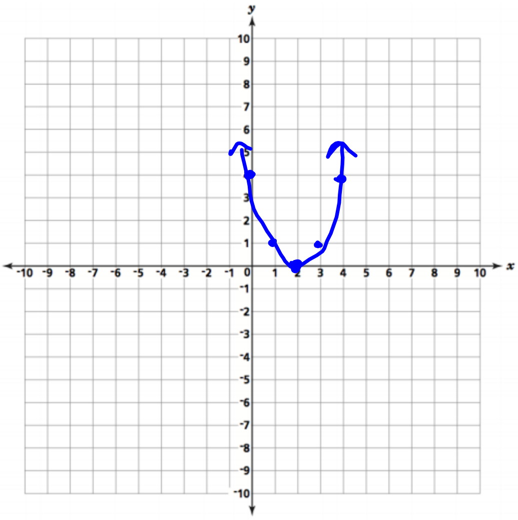
$f(0) = 0$
$f(1) = 1$
$f(2) = 4$
$f(-1) = 1$
$f(-2) = 4$

From the vertex...
"Right 1, Up 1"
"Right 2, Up 4"

| x | y |
|---|---|
| -2 | 4 |
| -1 | 1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 4 |

Graph the function, $g(x) = -3(x - 2)^2 + 5$

opposite direction

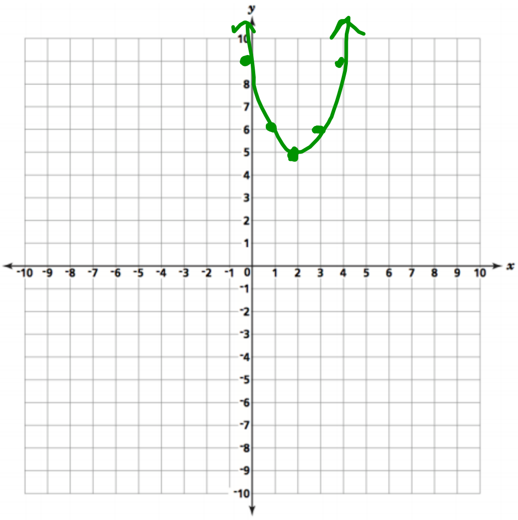


2. Identify and apply any horizontal translations

Since $h = -2$, then the parent graph is shifted 2 units to the right.

Graph the function, $g(x) = -3(x-2)^2 + 5$

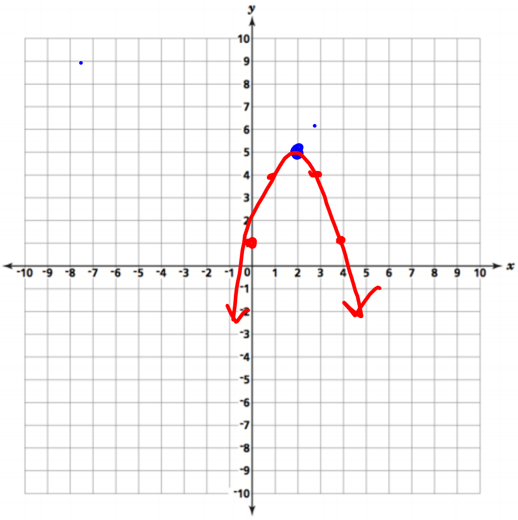
Same Direction



3. Identify and apply any vertical translations

K=5, shift my current graph 5 units up.

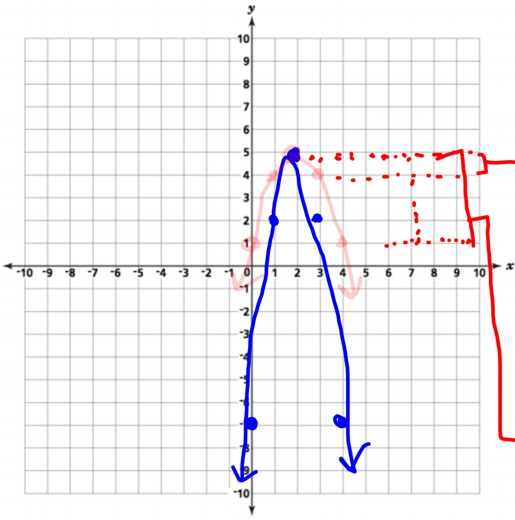
Graph the function, $g(x) = -3(x - 2)^2 + 5$



4. Check if "a" is positive (+) or negative (-). If "a" is negative, reflect your current graph over the vertex. If "a" is positive, move on to the next step.

"a" is negative, so the graph is reflected over the vertex.

Graph the function, $g(x) = -3(x-2)^2 + 5$



5. Multiply the distance of your coordinate points by a factor of "a"

Vertical distance from the vertex to the first coordinates is 1.

Vertical distance from the vertex to the second coordinates is 4.

We stretch the graph vertically by a factor of 3.
In other words, we multiply the vertical distance by 3 to obtain our last transformation.