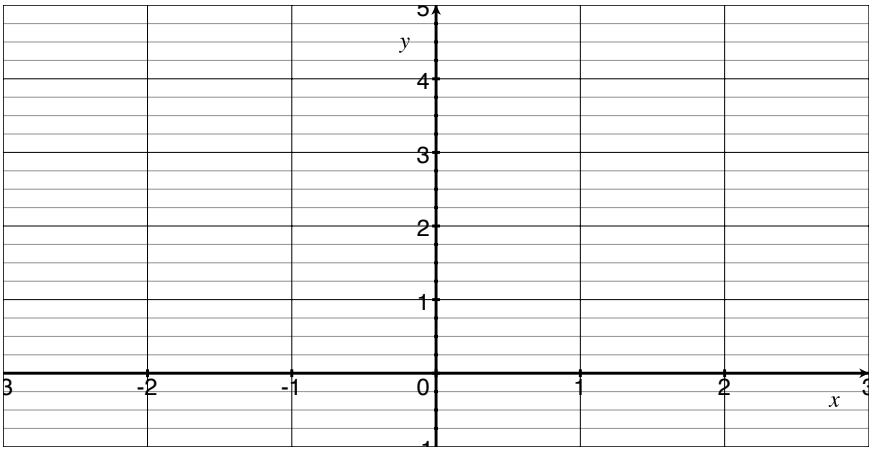
Vertex Form

Get into groups of two to three and work on the following.

Let $f(x) = x^2$ for the entirety of this worksheet.

1. Draw the graph of f.

2. What is the name of graphs that have this U-shape? (You can verify your answer by looking at the Transforming Functions Worksheet or page 7 of Ratti.)



3. The minimum point on the graph of f is called the *vertex*. What are the coordinates of the vertex of f?

4. Recall §1.5 (what was that about again?) and finish the following sentence: The graph of $g(x) = (x + 1)^2 + 2$ looks like the graph of f, but shifted...

5. Draw the graph of g and write the coordinates of the vertex of g.

6. Finish the following sentence: The graph of $j(x) = (x - 1.5)^2 - 0$ looks like the graph of f, but shifted...

7. Draw the graph of j and write the coordinates of the vertex of j.

8. Consolidate the work on the previous page and fill out the table:

function	horizontal shifts	vertical shifts	vertical coordinates
$f(x) = x^2$ or $= (x-0)^2 + 0$	none	none	$(0,0)$
$g(x) = (x+1)^2 + 2$			
$j(x) = (x-1.5)^2 - 0$			

9. Let h & k be positive numbers. Finish the following sentence: The graph of

$$v(x) = (x-h)^2 + k$$

looks like the graph of f, but shifted....

10. The graph of v is hard to draw when we don't have numbers for h or k. However, we know the coordinates of the vertex of f and we can trace the movement of this point through the graph transformations your described above in 8 and then write the coordinates of the vertex of v. What are the coordinates of the vertex of v?

11. Repeat the work you did for g in numbers 4 & 5 for each of the functions below and fill out the following table:

function	vertical stretch	horizontal shifts	vertical shifts	vertex coordinates
$f(x) = x^2$ or $= (x-0)^2 + 0$	none	none	none	$(0,0)$
$m(x) = 2(x+0)^2 + 2$				
$n(x) = 3(x-1)^2 - 0$				
$p(x) = 2(x-1)^2 - 1$				

12. Let h, k, and a be positive numbers and let $w(x) = a(x-h)^2 + k$. Consider the above table or perhaps trace the vertex of f through the graph transformations of w. Either way, find the coordinates of the vertex of w.