Transforming Functions

While working in a group make sure you:

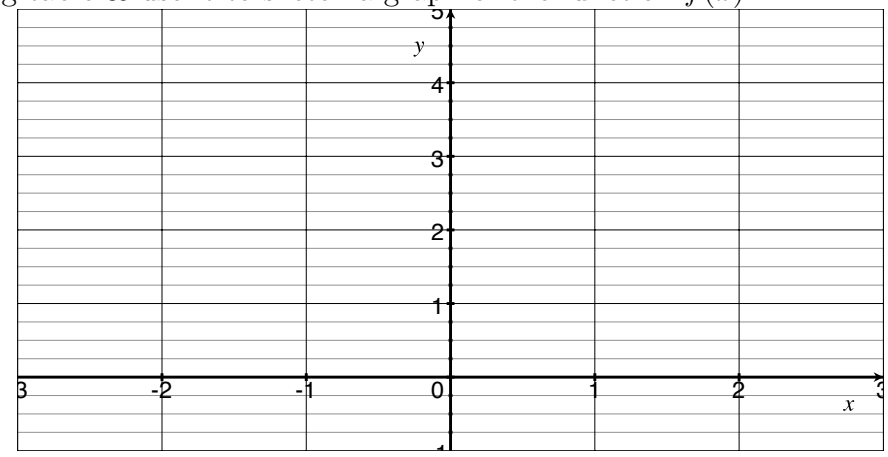
- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

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

1. (a) Find $f(2)$ and plot the point $(2, f(2))$ on the graph below.

   (b) Fill out the following table & use it to sketch a graph of the function $f(x)$.

x	$f(x)$
$\frac{-3}{2}$	
-1	
$\frac{-1}{2}$	
0	
2	



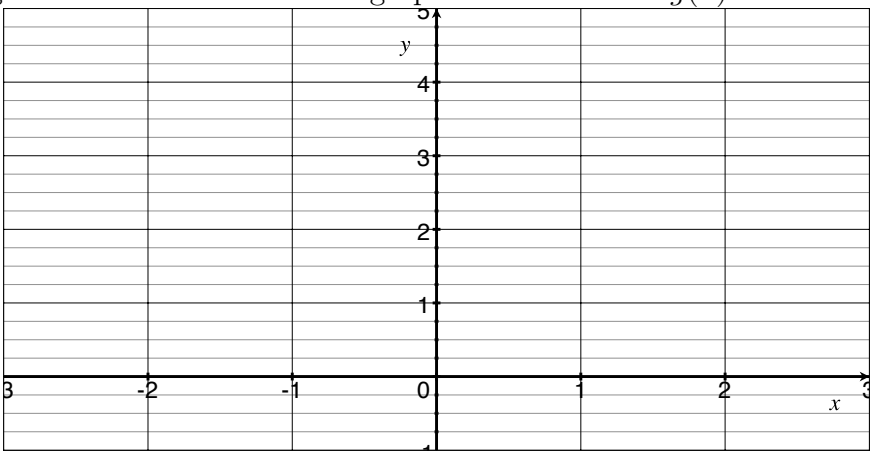
   This graph of a quadratic polynomial is called a *parabola*.

   (c) What is the domain of f in interval notation? The range?

2. Define a new function g to be $g(x) = f(x) + 1$. Since f was defined above, we know $f(x) = x^2$, so we can write *the rule* of g more explicitly as $g(x) = x^2 + 1$.

   (a) Fill out the following table & use it to sketch a graph of the function $g(x)$.

x	$g(x)$
$\frac{-3}{2}$	
-1	
$\frac{-1}{2}$	
0	
2	



   (b) Finish the following sentence:
   The graph of g looks like that of f from # 1. but shifted...

3. Define a new function k to be $k(x) = f(x) + 2$. Without plotting points like we did for Problems 1 and 2, can you say what the graph of k will look like? Either explain what it will look like or draw it on the above graph.

4. Suppose f is a function and $a > 0$. Define functions g and h by

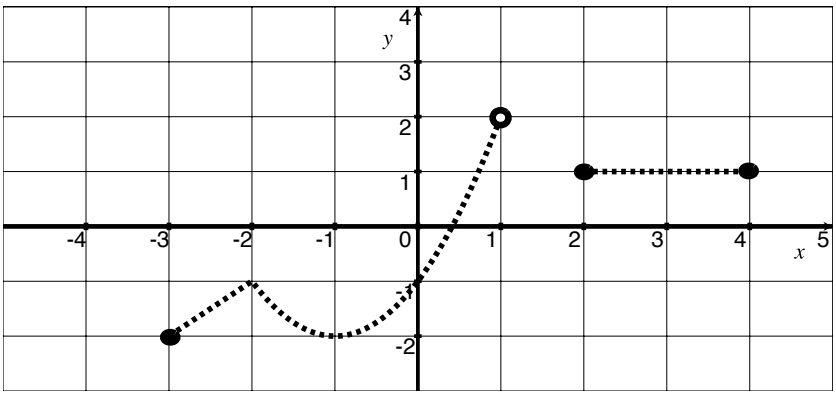
$$g(x) = f(x) + a \quad \text{and} \quad h(x) = f(x) - a.$$

Complete the following sentences:

- The graph of g is obtained by shifting the graph of f ...

- The graph of h is obtained by shifting the graph of f...

5. The graph of a piece-wise defined function labeled g is below. To be explicit, all the pieces of the dotted graph below make up the graph of g. Note that although the graph of g is disconnected, g passes the vertical line test so it *is* a function.



(a) Find the domain of g.

(b) Find the range of g.

(c) For what value(s) of x does $g(x) = -1$?

(d) Use your answer from Number 4 and draw the graphs of $m(x) = g(x) + 2$ and $n(x) = g(x) - 1$ on the set of axes.