

Group #: _____ Name: _____

The point of learning various function transformations is for us to develop a quick intuition of what a given function looks like by starting with a very simple and well-known shape. Knowing that a given function is just a translated, scaled, or reflected version of a standard shape allows us to quickly form mental pictures of its properties.

1. (40 points) Write the equation of the function $f(x)$ in term of $g(x) = x^2$ first then in terms of x (i.e., simplify the expression by using the definition of $g(x)$.) if the graph of $f(x)$ is obtained
 - (a) by stretching the graph of $g(x)$ by a factor of 2 vertically, then shift it to the right by 7 units.
 - (b) by shrinking the graph of $g(x)$ by a factor of $\frac{1}{2}$ horizontally, then shift it to the left by 5 units.
 - (c) by reflecting the graph of $g(x)$ across the y -axis, then shift it down by 4 units.
 - (d) by reflecting the graph of $g(x)$ across the x -axis, then shift it up by 1 unit.

For example, if the graph of $f(x)$ is obtained by reflecting the graph of $g(x) = x^3$ across the y -axis then shifting to the left 5 units, the answer would look like

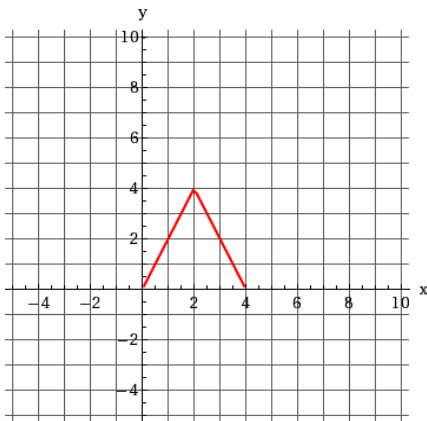
$$f(x) = g(-(x + 5)) = [-(x + 5)^3] = -(x + 5)^3 \quad (\text{you do not need to simplify any further})$$

2. (20 points, 10 points each) Sketch the graph of the following functions, not by plotting points, but by starting with the graph of a standard function and applying transformations. Be sure to **write down the sequence of steps** you take to obtain the given function from transforming the original, standard function.
 - (a) $g(x) = -3 + \frac{1}{2}\sqrt{x + 4}$
 - (b) $h(x) = 3 - 2(x - 1)^2$

3. (20 points, 10 points each) The graph of $f(x)$ is given below. Sketch and label the graphs of the following functions. Be sure to indicate your scale and label your graph clearly. For example, what points does the graph cross through? What does each tick mark represent, 1 unit, 2 units, or something else?

(a) $f_1(x) = -2f(x) - 3$

(b) $f_2(x) = f\left(\frac{1}{2}x + 3\right)$



4. (20 points, 10 points each) Determine whether the given function is even, odd, or neither. Be sure to show work.

(a) $f(x) = x^5 + x$

(b) $f(x) = x^2 + x$