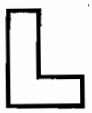
So far, when we have been talking about functions, we have been assuming that their domains and ranges have been sets of numbers. This is not necessarily the case. For example, look at this figure:



Let's let our domain be all the different ways we can move this figure around, including flipping it over:

$D =$ 

Now let f be the function that rotates the shape 90° clockwise: $f\left($  $\right) =$  . Let g be the function that takes flips the shape over across a vertical line drawn through the center: $g\left($  $\right) =$ 

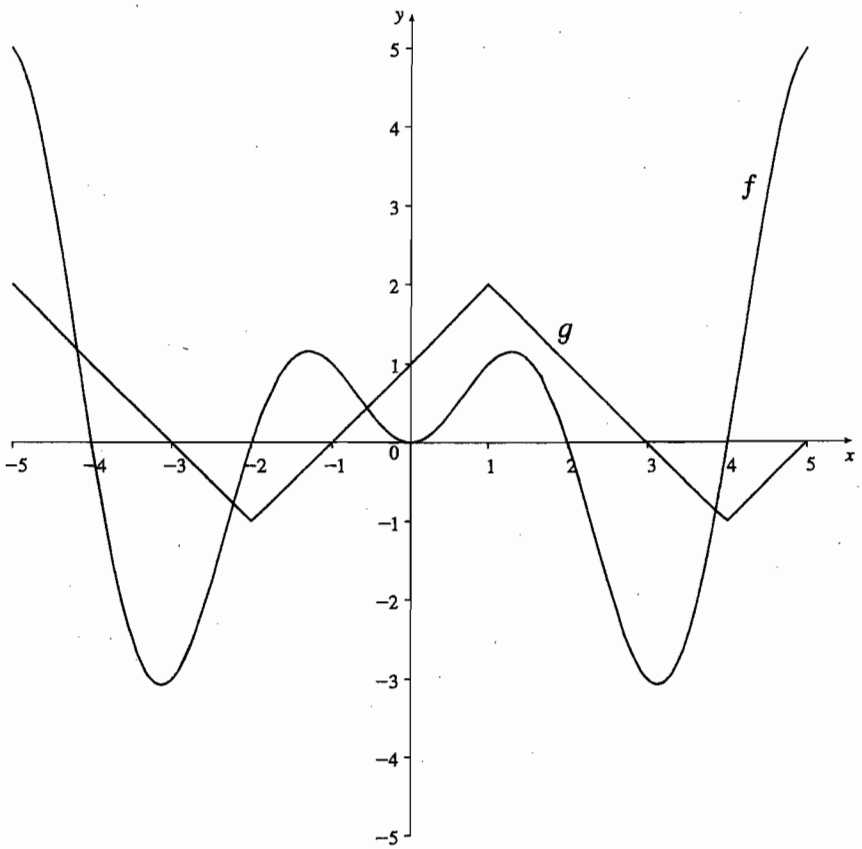
1. Find the following:

(a) $f\left($  $\right)$ (b) $g\left($$\right)$ (c) $f\left(f\left($$\right)\right)$ (d) $g\left(g\left($$\right)\right)$

2. Is it true that $f \circ g = g \circ f$? Why or why not?

3. Is it true that $g \circ g \circ g = g$? Why or why not?

4. Write, in words, what the function $f \circ f \circ f$ does to a shape.



1. $(f \circ g)(5)$
2. $(g \circ f)(5)$
3. $(f \circ g)(0)$
4. $(f \circ f)(5)$
5. $(g \circ g)(5)$
6. $(g \circ g)(-3)$
7. $(g \circ g)(-1)$
8. $(f \circ g)(1)$
9. $(g \circ f)(1)$
10. $(f \circ f \circ g)(4)$
11. $(g \circ f \circ f)(4)$
12. $(f \circ g \circ f)(4)$