

**Class Work: Composition of functions**

This is a full-time activity worth 10 points.

**Problems of the Day**

1. For each of the following, give an example of functions  $f : A \rightarrow B$  and  $g : B \rightarrow C$  that satisfy the stated conditions, or explain why no such example exists. (You can use diagrams for many, if not all, of these.)
  - (a) The function  $f$  is an injection but the function  $g \circ f$  is not an injection.
  - (b) The function  $f$  is a surjection but the function  $g \circ f$  is not a surjection.
  - (c) The function  $f$  is not a surjection, but the function  $g \circ f$  is a surjection.
  - (d) The function  $f$  is not an injection, but the function  $g \circ f$  is an injection.
2. Let  $A, B, C$  be nonempty sets and assume that  $f : A \rightarrow B$  and  $g : B \rightarrow C$  are functions. Choose one of the following to prove:
  - (a) Prove that if  $g \circ f : A \rightarrow C$  is an injection, then  $f : A \rightarrow B$  is an injection.
  - (b) Prove that if  $g \circ f : A \rightarrow C$  is a surjection, then  $f : A \rightarrow B$  is a surjection.

Hint: Both of these are conditional statements. A direct proof of either of these may not be the best approach.

**Parameters**

If your group finishes your work, please hand it in at the end of class. If all groups finish by the end of class, we will take time to debrief the solutions to one or more of these.