

# Homework 14

MATH 301  
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1. (a) **Proposition.** *If both  $f$  and  $g$  are injective, then  $g \circ f$  is injective.*

*Proof.* Suppose  $f : A \rightarrow B$  and  $g : B \rightarrow C$  are injective. Then for all  $a, a' \in A$  where  $a \neq a'$ ,  $f(a) \neq f(a')$ , i.e. a different input to  $f$  results in a different output. Then since  $g$  is injective too,  $g(f(a)) \neq g(f(a'))$ . Therefore  $g \circ f$  is injective. ■

- (b) **Proposition.** *If both  $f$  and  $g$  are surjective, then  $g \circ f$  is surjective.*

*Proof.* Suppose  $f : A \rightarrow B$  and  $g : B \rightarrow C$  are surjective. ■