

### HW 3.

1. Explain why it is true that the function  $F : A \rightarrow \mathcal{P}(A) : a \mapsto \{a\}$  is injective.
  
2. In this problem,  $f : A \rightarrow B$  and  $g : B \rightarrow C$  will be composable functions.
  - (a) Show that if  $g \circ f$  is injective, then  $f$  is injective, while if  $g \circ f$  is surjective, then  $g$  is surjective.
  
  - (b) Show that if  $g \circ f$  is surjective, then  $g$  is surjective.
  
3. This is a continuation of Problem 2, so assume that  $f : A \rightarrow B$  and  $g : B \rightarrow C$  are composable functions.
  - (a) Give an example where  $g \circ f$  is injective, but  $g$  is not injective.
  
  - (b) Give an example where  $g \circ f$  is surjective but  $f$  is not surjective.