# MATH 102: IDEAS OF MATH

## WORKSHEET 15

*Problem* 1. Suppose $A$ and $B$ are sets with finite number of elements and $f : A \to B$ is a function. Can you compare the sizes of $A$ and $B$ based on injectivity and surjectivity?

**Definition 1.** Let $A, B$, and $C$ bet sets, $g : A \to B$ and $f : B \to C$. Then the *composition* function $f \circ g : A \to C$ is defined by:

$$(f \circ g)(a) = f(g(a)) .$$

**Theorem 1.** *Suppose $A, B$ and $C$ are sets. If $g : A \to B$ and $f : B \to C$ are injective. Then, $f \circ g : A \to C$ is injective.*

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**Theorem 2.** *Suppose $A, B$ and $C$ are sets. If $g : A \to B$ and $f : B \to C$ are surjective. Then, $f \circ g : A \to C$ is surjective.*

**Theorem 3.** *Suppose $A, B$ and $C$ are sets. If $g : A \to B$ and $f : B \to C$ are bijective. Then, $f \circ g : A \to C$ is bijective.*