1. Find sets A and B and functions $f : A \to B$ and $g : B \to A$ so that f is not a bijection, g is not a bijection, and $f \circ g$ is a bijection.

2. Define $f : \mathbf{R} \to \mathbf{R} \times \mathbf{R}$ with the formula $f(x) = (x^2, \sin(x))$.
   (a) Is f an injection?
   (b) Is f a surjection?

3. Let $\mu_7 = \{\alpha \in \mathbf{C} : \alpha^7 = 1\}$. Define $f : \mu_7 \to \mu_7$ with the formula $f(\alpha) = \alpha^2$. Is the function f injective, surjective, both, or neither?

4. Now set $\mu_{12} = \{\alpha \in \mathbf{C} : \alpha^{12} = 1\}$. Define $g : \mu_{12} \to \mu_{12}$ with the formula $g(\alpha) = \alpha^2$. Is the function g injective, surjective, both, or neither?

5. Define a new set operation $A \triangle B$ with the formula

$$A \triangle B = (A \setminus B) \cup (B \setminus A).$$

On the last homework, we saw that $A \triangle B = (A \cup B) \setminus (A \cap B)$. This operation is sometimes called the *symmetric difference* of the sets A and B.
   (a) Show that $A \triangle B = B \triangle A$.
   (b) Show that $(A \triangle B) \triangle C = A \triangle (B \triangle C)$.