MATH 243 – Mathematical Structures
Quiz 8 – November 17, 2017

Your Name: _____

Directions

Do all work and answer all questions on this sheet. (Use the back if you need more space.) There are 30 possible points, distributed as indicated.

A) Let $f : \mathbb{Z} \to \mathbb{Z}/12\mathbb{Z}$ be the mapping defined by $f(x) = [x + 3] \in \mathbb{Z}/12\mathbb{Z}$.

(1) (7) Is f injective? Why or why not?

(2) (7) Let $T = \{x \in \mathbb{Z} : x \text{ is odd}\} \subset \mathbb{Z}$. What is $f(T)$? (Describe using correct set notation; you need not give a full proof of your assertion.)

(3) (6) Let $U = \{[2], [4]\} \subset \mathbb{Z}/12\mathbb{Z}$. What is $f^{-1}(U)$? (Describe using correct set notation; you need not give a full proof.)

B) (10) Prove that if $f : A \to B$ is a mapping, and $b_1 \neq b_2$ are any two distinct elements of B, then $f^{-1}(\{b_1\}) \cap f^{-1}(\{b_2\}) = \emptyset$. (**Note**: This is a completely general statement. You may not use properties of any particular example, only the definitions of the concepts involved here.)