

Abstract Algebra 1
Quiz 5

Name: _____

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. State the First Isomorphism Theorem.

First Isomorphism Theorem. If $h: \mathbb{A} \rightarrow \mathbb{B}$ is a homomorphism, then $\bar{h}: \text{coim}(h) \rightarrow \text{im}(h)$ is an isomorphism.

2. Give an example of a group endomorphism that is not an automorphism.

An endomorphism is a homomorphism from a group to itself. An endomorphism is an automorphism if it is invertible. Thus, the problem asks for a homomorphism from a group to itself that is not invertible.

Some examples:

- (1) For any G with $|G| > 1$, then constant function $h: G \rightarrow G: x \mapsto 1$ is an endomorphism that is not an automorphism.
- (2) Absolute value: $A: \langle \mathbb{R}^\times; \cdot, ^{-1}, 1 \rangle \rightarrow \langle \mathbb{R}^\times; \cdot, ^{-1}, 1 \rangle: x \mapsto |x|$.
- (3) $h: C_4 \rightarrow C_4: x \mapsto x^2$.