

Abstract Algebra 1

Quiz 1

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. Define “monoid”.

A **monoid** is an algebraic structure $\langle M; \circ, 1 \rangle$, defined in signature with a binary operation \circ and a zeroary operation 1 , which satisfies laws saying that \circ is an associative operation and 1 is a left and right identity element for \circ .

2. Describe examples of monoids \mathbb{M} and \mathbb{N} and a homomorphism $h: \mathbb{M} \rightarrow \mathbb{N}$.

The simplest example is the one where $\mathbb{M} = \mathbb{N} = \langle \{1\}; \circ, 1 \rangle$ are 1-element monoids and $h: \mathbb{M} \rightarrow \mathbb{N}$ is the identity function.

We gave this example in class:

$$h: \langle M_2(\mathbb{R}); \cdot, I \rangle \rightarrow \langle \mathbb{R}; \cdot, 1 \rangle: X \mapsto \det(X).$$