MATH 113, QUIZ #2
September 3

1. Let $f : \mathbb{Z}_6 \to U_6$ be the function defined by $f(\overline{k}) = \left(e^{\frac{\pi}{3}i}\right)^{2k}$. Prove that f is a homomorphism but NOT an isomorphism (of binary structures).

2. Let $\langle F, + \rangle$ denote the set of all functions $f : \mathbb{R} \to \mathbb{R}$ under pointwise addition. Is the map $\varphi : \langle F, + \rangle \to \langle F, + \rangle$ defined by $f(x) \mapsto x \cdot f(x)$ a homomorphism? Give a clear explanation.

3. Prove that commutativity of the binary operation is a structural property for binary algebraic structures. I.e. if $\varphi : \langle S, * \rangle \to \langle S', *' \rangle$ is an isomorphism and $*$ is commutative, then so is $*'$.