

MA 665 EXERCISES 4

- (1) Show that the ring homomorphism $\mathbb{Z} \hookrightarrow \mathbb{Q}$ is both a monomorphism and an epimorphism in the category of commutative rings with unit, though it is not an isomorphism.
- (2) If $\mathcal{G}$ and $\mathcal{H}$ are groups regarded as categories with one object, characterize functors from $\mathcal{G}$ to $\mathcal{H}$.
- (3) In a category with a zero object, show that the zero morphism from an object A to an object B is unique. In other words, if the category has two zero objects Z and Z' , then the composites $A \rightarrow Z \rightarrow B$ and $A \rightarrow Z' \rightarrow B$ are the same.