1. Let S be a set. The group with presentation (S, R) where $R = \{[s,t] | s,t \in S\}$ is called the free abelian group on S denote it by $A(S)$. Prove that $A(S)$ has the following universal property: if G is any abelian group and $\varphi : S \to G$ is any set map, then there is a unique group homomorphism $f : A(S) \to G$ such that $f|_S = \varphi$.