Question 1. Let $G$ (not necessarily abelian) be a group and consider the functor $F : \textbf{Ab} \to \textbf{Set}$ given by $F(−) = \text{Hom}_{\text{Grp}}(G, −)$. Is this functor representable?

Question 2. Consider the functor $F : \textbf{Grp} \to \textbf{Set}$ given by $F(G) = \{g \in G \mid g^2 = e\}$. Is this functor representable? What about the functor $[\text{tor}] : \textbf{Grp} \to \textbf{Set}$ given by $G[\text{tor}] = \{g \in G \mid g^n = e \text{ for some } n\}$?

Question 3. Fix nonempty sets $Y, Z$ and consider the contravariant functor $F : \textbf{Set} \to \textbf{Set}$ given by $F(X) = \text{hom}(X, Y) \bigsqcup \text{hom}(X, Z)$. Is this functor representable?

Question 4. Prove that representable functors preserve limits.