MATH210A: Week 9

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

Question 2. Consider the functor $F : \boldsymbol{Grp} \to \boldsymbol{Set}$ given by $F(G) = \{g \in G \mid g^2 = e\}$. Is this functor representable? What about the functor $[\text{tor}] : \boldsymbol{Grp} \to \boldsymbol{Set}$ 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 $F : \boldsymbol{Set} \to \boldsymbol{Set}$ given by $F(X) = \hom(X, Y) \coprod \hom(X, Z)$. Is this functor representable?

Question 4. Prove that representable functors preserve limits.