1. Find an isomorphism between $\langle \mathbb{Z}, + \rangle$ and $\langle 2\mathbb{Z}, + \rangle$. (Page 133 #1)

2. Show that $U(20)$ is not isomorphic to $U(24)$.

3. Show that $U(8)$ is isomorphic to $U(12)$. (Page 133 #5)

4. Let $G$ be a group. Prove that the mapping $\alpha(g) = g^{-1}$ for all $g \in G$ is an automorphism if and only if $G$ is Abelian. (Page 134 #10)

5. Let $\phi : G \longrightarrow H$ be a group homomorphism. Prove that $\phi(a) = \phi(b)$ if and only if $ab^{-1} \in \ker \phi$.

6. Consider $\langle \mathbb{Z}, + \rangle$ and $\mathbb{Z}_3$.
   
   (a) Show that $\langle \mathbb{Z}, + \rangle \not\approx \mathbb{Z}_3$.
   
   (b) Show that $\text{Aut}(\langle \mathbb{Z}, + \rangle) \approx \text{Aut}(\mathbb{Z}_3)$.

7. Find $\text{Aut}(\mathbb{Z})$ (Page 133 #2)

8. Find $\text{Aut}(S_3)$. 