Problem 83: Suppose that $G$, $H$, and $K$ are groups and further suppose that $\phi : G \to H$ and $\psi : H \to K$ are isomorphisms, that is, $G \approx H$ and $H \approx K$. Show that $G$ is isomorphic to $K$, that is, $G \approx K$.

Problem 84: Suppose that $(G_1, \ast_1)$ is a group with identity element $e_1$ and $(G_2, \ast_2)$ is a group with identity element $e_2$. If $\phi : G_1 \to G_2$ is an isomorphism, prove the following properties.

a. $\phi(e_1) = e_2$.

b. $x$ and $y$ commute in $G_1$ if and only if $\phi(x)$ and $\phi(y)$ commute in $G_2$.

c. For every $x \in G_1$ and every integer $n$, $\phi(x^n) = [\phi(x)]^n$.

Problem 85: Show that if $G$ is a cyclic group of infinite order, then $G \approx \mathbb{Z}$. 