Chapter 6, #46: Prove that $\mathbb{R}$ with operation addition is not isomorphic to $\mathbb{R}^*$ with operation multiplication.

Define the group $Q_8$ by

$$Q_8 = \{ 1, -1, i, j, k, -i = (-1)i = i(-1), -j = (-1)j = j(-1), -k = (-1)k = k(-1) \},$$

with identity 1 and relations defined by

$$i^2 = j^2 = k^2 = -1, (-1)^2 = 1, ij = k, ji = -k, jk = i, kj = -i, ki = j, ik = -j.$$

Are $D_4$ and $Q_8$ isomorphic?

Chapter 6, #14: Find two groups $G, H$ such that $G \not\cong H$ but $\text{Aut}(G) \cong \text{Aut}(H)$. 