PM346 Assignment 2 - Due Jan 30.

1. Describe <u>all</u> homomorphisms from C_6 to S_3

2. Describe <u>all</u> homomorphisms from S_3 to C_6

3. Describe <u>all</u> automorphisms of $(\mathbb{Q}, +)$

4. If H and N are subgroups of G we define the product $H.N = \{hn : h \in H, n \in N\}$

   a) Prove that if N is normal in G, then HN is a subgroup of G

   b) Prove that if H and N are both normal in G, then HN is a normal subgroup of G

   c) Prove that $H \cap N$ is a subgroup of G

   d) Prove that if N is a normal subgroup of G, then $H \cap N$ is a normal subgroup of H.

5. Prove that if H and N are normal subgroups of G and $H \cap N = \{1\}$, then $\forall a \in H$ and $\forall b \in N$ we have $ab = ba$.