Do three of following problems.

1. A ring \( R \) is called a \textit{Boolean ring} if \( a^2 = a \) for all \( a \in R \). Prove that every Boolean ring is commutative.

2. Show that every ideal in a Euclidean Domain is principal.

3. Let \( R \) be a commutative ring with identity and \( M \) an ideal of \( R \). Show that \( M \) is a maximal ideal if and only if \( R/M \) is a field.

4. List all non-isomorphic abelian groups of order 2704.

5. (The second isomorphism theorem) Let \( N \) be a normal subgroup of a group \( G \) and \( A \) another subgroup of \( G \). Show that \( AN \) is a subgroup of \( G \) and \( AN/N \) is isomorphic to \( A/(A \cap N) \).

6. Let \( G \) be a finite group with order \( n \), and \( H \) a subgroup of \( G \) such that \( n \) is not a divisor of \( i_G(H)! \) where \( i_G(H) = \frac{o(G)}{o(H)} \) and \( o(H) \) is the order of the group \( H \). Show that there is a normal subgroup \( N \) of \( G \) contained in \( H \).