1 Ring Theory

1.1 Ring homomorphisms and ideals

Ring homomorphisms, Properties of ring homomorphisms, Kernels of homomorphisms, Ideals of a ring, Ideal generated by a subset of a ring, Operations on ideals.

1.2 Quotient rings and isomorphism theorems

Quotient rings, Isomorphism theorems I, II and III, Field of quotients, Prime and maximal ideals, Regular rings.

1.3 Divisibility and factorisation in rings

Divisibility in integral domains, Irreducible and prime elements, Unique factorisation domains, Principal ideal domains, Euclidean domains.

1.4 Polynomial rings

Polynomial rings over commutative rings, Division algorithm and consequences, Factorization of polynomials, Unique factorization in $\mathbb{Z}[x]$, Reducibility and irreducibility tests, Eisenstein criterion.