ABSTRACT

FACTORIZATION IN QUADRATIC FIELD $Q[\sqrt{d}]$

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For a square free integer d other than 1,

Let,

$K = Q[\sqrt{d}] = \{x + y\sqrt{d}: x, y \in Q\}$

This is called a quadratic field and it has degree 2 over Q. We will define a concept of "integer" for K, which will play the same role in K as the ordinary integers Z do in Q.

The integer of K are

$\{a + b\sqrt{d}: a, b \in Z\}$ if $d \not\equiv 1 \: mod \: 4$

and

$\{a + b(\frac{1+\sqrt{d}}{2}): a, b \in Z\}$ if $d \equiv 1 \: mod \: 4$

For $\alpha \in K$, set $Tr(\alpha) = \alpha\bar{\alpha}$ and $N(\alpha) = \alpha\bar{\alpha}$. These are called the trace and norm of α . We denote the integers of K as $\mathcal{O}_k$. Unigue factoritation in the integers of K does not always hold. The norm will play important role. If $\alpha \in \mathcal{O}_k$ has norm which is prime in Z, then α is irreducible in $\mathcal{O}_k$.

Key Words : square integer , quadratic field , integer of K , trace , norm , prime, irreducible.