SOME METHODS FOR EVALUATING THE REGULATOR OF A REAL QUADRATIC FUNCTION FIELD

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ABSTRACT. We develop methods for the rapid computation of the regulator of a real quadratic congruence function field $K = k(x)(\sqrt{D})$. By extending Shanks' infrastructure ideas in real quadratic number fields to real quadratic congruence function fields we obtain a baby step – giant step method for evaluating the regulator of K in $O(|D|^{1/4})$ polynomial operations. We also show the existence of an effective algorithm which computes the regulator unconditionally in $O(|D|^{1/5})$ polynomial operations. By implementing both methods on a computer, we found that the $O(|D|^{1/5})$-algorithm tends to be far better than the baby step – giant step algorithm in those cases where the regulator exceeds 10^8.