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**Ideal Arithmetic and Infrastructure
in Purely Cubic Function Fields**

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Abstract this paper investigates the arithmetic of fractional ideals and the infrastructure of the principal ideal class of a purely cubic function field of unit rank one. We first describe how irreducible polynomials split into prime ideals in purely cubic functions fields of nonzero unit rank. This decomposition behavior is used to compute so-called canonical bases of fractional ideals; such bases are very suitable for computation. We state algorithms for ideal multiplication and, in the case of unit rank one, ideal reduction. The paper concludes with an analysis of the infrastructure in the set of reduced fractional principal ideals of a purely cubic function field of unit rank one.