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Title: The relative class number one problem for function fields, II : Nonexistence of noncyclic covers

Abstract. The goal here is to classify all extensions of function fields of curves over finite fields for which the relative class number is one (i.e., the class numbers of the two function fields coincide). In Part I of this work (ANTS, 2022) we reduced this to a finite computation by identifying the possible pairs of zeta functions of the two function fields. In Part II we show that excluding trivial cases, any such extension is Galois and cyclic; this requires an analysis of potential noncyclic covers of degrees 3–7 based on their zeta functions, which borrows many ideas from the study of curves over finite fields with many rational points. (Part III will be presented at the LuCaNT conference later this summer.)