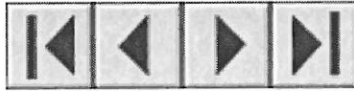


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Item 2 of 4



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**96g:11132** [11R21](#) ([11R09](#))

[Shen, Yuan Yuan](#); [Washington, Lawrence C.](#) (1-MD)

**A family of real  $p^n$ -tic fields. (English summary)**

*Canad. J. Math.* **47** (1995), no. 3, 655–672.

The authors extend the construction they gave in a previous article where they used elements of  $\mathrm{PGL}_2(\mathbf{R})$  in order to construct families of fields of degree  $2^n$  over  $\mathbf{Q}$ , and they obtain here one-parameter families of polynomials of degree  $p^n$  (for a given prime  $p$ ) which are irreducible by Faltings' theorem (except for finitely many values of the parameter  $a$ ) and from the roots of which they are able to construct a (nonmaximal) set of independent units for the splitting field.

More precisely, the authors introduce the family of polynomials  $P_n(X, a) = R_n(X) - ap^{-n}S_n(X)$ , where  $a$  is a real parameter which is contained in the ring of integers  $\mathcal{O} = \mathbf{Z}[\zeta_q + \zeta_q^{-1}]$  of the real subfield of the  $q$ th cyclotomic field  $\mathbf{Q}[\zeta_q]$  (with  $q = p$  for odd prime  $p$ ,  $q = 4$  for  $p = 2$ ) and where  $R_n(X)$  and  $S_n(X)$  are the polynomials in  $\mathcal{O}[X]$  given by the expansion  $(X - \zeta_q)^{p^n} = R_n(X) - \zeta_q S_n(X)$ .

In the particular case  $p = 3$ , the polynomials  $P_n(x, a)$  are irreducible over  $\mathbf{Q}$  for every  $a$  (they have rational integral coefficients); so they can be regarded as generalizations of the "simplest" cubic polynomials of D. Shanks [*Math. Comp.* 28 (1974), 1137–1152; [MR 50 #4537](#)]. Lastly, for composite  $p$  which are not a prime power, as observed by the authors, a slight variation of their method allows one to obtain a previous construction given by M.-N. Gras [*Math. Comp.* 48 (1987), no. 177, 179–182; [MR 88m:11092](#)] for cyclic sextic fields or by C. Levesque for fields of degree 10 or 12.

*Reviewed by* [Jean-Francois Jaulent](#)

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