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95c:11125 [11R21](#) ([11R09](#) [11R27](#))

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

A family of real 2^n -tic fields. (English summary)

Trans. Amer. Math. Soc. **345** (1994), no. 1, 413–434.

In this paper, the authors intend to extend results obtained by M.-N. Gras [Publ. Math. Fac. Sci. Besancon Theor. Nombres 1978, no. 2, Annee 1977–78, 53 pp.; Zbl 471:12006] and by Shen [Trans. Amer. Math. Soc. 326 (1991), no. 1, 179–209; [MR 91j:11092](#)] on the construction of cyclic extensions of the rationals \mathbf{Q} .

They first define the family of 2^n -tic polynomials:

$$P_n(X; a) = \operatorname{Re}((X + i)^{2^n}) - (a/2^n)\operatorname{Im}((X + i)^{2^n}),$$

and determine when these $P_n(X; a)$, $a \in \mathbf{Z}$, are irreducible. The principal properties of $P_n(X; a)$ are as follows: These polynomials generate the fields of degree 2^n , which were studied by Gras in the case $n = 2$, and by Shen in the case $n = 3$. However, in the case $n \geq 4$, these fields are in general non-Galois, although they lift to cyclic extensions over the 2^n -th cyclotomic field $\mathbf{Q}(\zeta_{2^n})$. The roots of $P_n(X; a)$ are all real and are permuted cyclically by the linear fractional transformations defined over the real subfield of $\mathbf{Q}(\zeta_{2^n})$, and, for the group S of units generated by the roots, if E_1 is a subgroup of the full unit group such that $E_1 \supseteq S$ and $[E_1 : S] < \infty$, then this index is bounded uniformly as the parameter for the family varies.

Reviewed by [H. Yokoi](#)

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