

## INEQUALITIES ON REAL ROOTS OF POLYNOMIALS

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*Abstract.* We survey the most used bounds for positive roots of polynomials and discuss their efficiency. We obtain new inequalities on roots of polynomials. Then we give new inequalities on roots of orthogonal polynomials, obtained from the differential equations satisfied by these polynomials.

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### REFERENCES

- [1] A. AKRITAS, A. STRZEBOŃSKI, P. VIGKLAS, *Implementations of a new theorem for computing bounds for positive roots of polynomials*, Computing, **78**, 355–367 (2006).
- [2] O. BOTTEMA, *Die Nullstellen der Hermitischen Polynome*, Nederl. Akad. Wetensch. Proc., **33**, 495–503 (1930).
- [3] W. H. FOSTER, I. KRASIKOV, *Bounds for the extreme zeros of orthogonal polynomials*, Int. J. Math. Algorithms, **2**, 307–314 (2000).
- [4] J. B. KIOUSTELIDIS, *Bounds for positive roots of polynomials*, J. Comput. Appl. Math., **16**, 241–244 (1986).
- [5] I. KRASIKOV, *Nonnegative Quadratic Forms and Bounds on Orthogonal Polynomials*, J. Approx. Theory, **111**, 31–49 (2001)
- [6] A. LAFORGIA, *A monotonic property for the zeros of ultraspherical polynomials*, Proc. Amer. Math. Soc., **83**, 757–758 (1981),
- [7] J.-L. LAGRANGE, *Traité de la résolution des équations numériques*, Paris (1798). (Reprinted in Œuvres, t. VIII, Gauthier-Villars, Paris (1879).)
- [8] E. LAGUERRE, *Mémoire pour obtenir par approximation les racines d'une équation algébrique qui a toutes les racines réelles*, Nouv. Ann. Math., 2ème série, **19**, 161–172, 193–202 (1880).
- [9] G. LONGCHAMP, *Théorème d'algèbre*, Nouv. Ann. Math. Série 2, **19**, 71–74 (1842).
- [10] M. MIGNOTTE, D. ȘTEFĂNESCU, *Polynomials – An algorithmic approach*, Springer Verlag (1999).
- [11] A. VAN DER SLUIS, *Upperbounds for Roots of Polynomials*, Numer. Math., **15**, 250–262 (1970).
- [12] D. ȘTEFĂNESCU, *New bounds for the positive roots of polynomials*, J. Univ. Comp. Sc., **11**, 2125–2131 (2005).
- [13] D. ȘTEFĂNESCU, *Inequalities on Upper Bounds for Real Polynomial Roots*, in Computer Algebra in Scientific Computing, 284–294, LNCS 4194 (2006).
- [14] G. SZEGÖ, *Orthogonal Polynomials*, Proc. Amer. Math. Soc. Colloq. Publ., vol. 23, Providence, RI (2003).
- [15] S. C. VAN VEEN, *Asymptotische Entwicklung un Nullstellenabschätzung der Hermitischen Funktionen*, Nederl. Akad. Wetensch. Proc., **34**, 257–267 (1931).
- [16] C. K. YAP, *Fundamental problems of algorithmic algebra*, Oxford University Press (2000).