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ALGEBRAIC POLYNOMIALS WITH RANDOM COEFFICIENTS WITH BINOMIAL AND GEOMETRIC PROGRESSION

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Abstract

The expected number of real zeros of a polynomial $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n$ with random coefficient a_j, $j = 0, 1, 2, \ldots, n$ is known. The distribution of the coefficients is often assumed to be identical albeit allowed to have different classes of distributions. For the non-identical case, there has been much interest where the variance of the jth coefficient is $\mathrm{var}(a_j) = \binom{n}{j}$. It is shown that this class of polynomials has significantly more zeros than the classical algebraic polynomials with identical coefficients. However, in the above case of non-identically distributed coefficients, it is assumed that the means of the coefficients are zero. Here we study a case, when the moments of the coefficients have both binomial and geometric progression elements. That is, we assume $E(a_j) = \binom{n}{j}\mu^{j+1}$ and $\mathrm{var}(a_j) = \binom{n}{j}\sigma^{2j}$. Further we assume, for any constant k, $\sigma^2 = k\mu$.

Keywords and phrases: number of real zeros, real roots, random algebraic polynomials, Kac-Rice formula, non-identical random variables.