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Loci of complex polynomials

For every complex polynomial $p(z)$, closed point sets are defined, called loci of $p(z)$. A closed set in the extended complex plane is a locus of $p(z)$ if it contains a zero of any of its apolar polynomials and is the smallest such set with respect to inclusion. Using the notion locus, several classical theorems in the geometry of polynomials can be refined (such as Grace's theorem, Grace-Walsh-Szego coincidence theorem, complex Rolle's theorem, and Laguerre's Theorem). We establish several fundamental properties of the loci and investigate their intriguing connections with the higher-order polar derivatives of $p(z)$. This is a joint work with Blagovest Sendov.