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Sobolev formal orthogonality on algebraic curves and extensions of Favard theorem[†]

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Abstract

In this paper Sobolev formal orthogonality on harmonic algebraic curves ($\Im(h(z)) = 0, h(z) \in \mathbb{C}[z]$) and equipotential curves ($|h(z)| = 1, h(z) \in \mathbb{C}[z]$) is defined and studied. In each case, such study is done through the characterization of bilinear forms whose associated functional annihilates at the multiples of $(h(z) - \bar{h}(z))^{2n+1}$ for harmonic algebraic curves, or the characterization of bilinear forms whose associated functional annihilates at the multiples of $(h(z)\bar{h}(z) - 1)^{2n+1}$ for equipotential curves, $n \in \mathbb{N}$. Such characterizations allow to find new extensions of Favard theorem in this setting.

Keywords: Sobolev inner product, Favard theorem, bilinear forms, sequence of moments.

MSC: Primary 42C05, 30E05; Secondary 11E39, 15A63.

Dedicated to Francisco Marcellán Español on his 60th birthday

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