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Inequalities for Polynomials on the Unit Square via the Krein-Milman Theorem

We provide sharp Bernstein and Markov inequalities for 2-homogeneous polynomials on the square $\square \subset \mathbb{R}^2$ with vertices $(0,0)$, $(1,0)$, $(1,1)$ and $(0,1)$. If $\mathcal{P}(^2\square)$ is the space of such polynomials, we also find the polarization constant of $\mathcal{P}(^2\square)$ and the unconditional constant for the canonical basis of $\mathcal{P}(^2\square)$. All the results are obtained by means of the Krein-Milman Theorem, using a characterization of the extreme 2-homogeneous polynomials on $\square$ which is also given in the paper.