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Polynomials non-negative on non-compact semialgebraic sets

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Abstract: Recently, M. Marshall answered a long-standing question in real algebraic geometry by showing that if $f(x, y) \in \mathbf{R}[x, y]$ and $f(x, y) \geq 0$ on the strip $[0, 1] \times \mathbf{R}$, then f has a representation $f = \sigma_0 + \sigma_1 x(1 - x)$, where $\sigma_0, \sigma_1 \in \mathbf{R}[x, y]$ are sums of squares. In this talk, we give the background to this result, which goes back to Hilbert's 17th problem, and our generalizations to other non-compact basic closed semialgebraic sets of \mathbf{R}^2 which are contained in strip. We also give some negative results.

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