A non-weak-star dense subspace of $L^\infty(\mathbb{R})$

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Abstract

We study the codimension of a family of subspaces of $L^\infty(\mathbb{R})$ endowed with the weak-star topology. The family depends on a parameter $\beta > 1$. We show that the codimension is always infinite and provide a description of these subspaces. The motivation is a paper by Håkan Hedenmalm and Alfonso Montes-Rodríguez, "Heisenberg uniqueness pairs and the Klein-Gordon equation", in which they study the case when $0 < \beta \leq 1$. Similarly to this paper the answer to the question depends on the study of invariant measures for piecewise monotonic transformation of an interval.