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Level sets of condition spectrum

Abstract

For $0 < \epsilon \leq 1$ and an element a of a complex Banach algebra $\mathcal{A}$ with unit e, the level set of ϵ- condition spectrum is defined as

$$L_\epsilon(a) ::= \left\{ \lambda \in \mathbb{C} : \|(a - \lambda.e)\| \left\|(a - \lambda.e)^{-1}\right\| = \frac{1}{\epsilon} \right\}.$$

We prove the following topological properties about $L_\epsilon(a)$

1. If $\epsilon = 1$ then $L_1(a)$ has an empty interior unless a is a scalar multiple of the unit.
2. If $0 < \epsilon < 1$ then $L_\epsilon(a)$ has an empty interior in the unbounded component of the resolvent set of a. Further, we show that, if the Banach space X is complex uniformly convex or X^* is complex uniformly convex, then for any operator $T \in B(X)$, $L_\epsilon(T)$ has an empty interior.

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