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Approximate counterexamples to the Barker–Larman problem in dimension 4

Consider a convex body $K \subseteq \mathbb{R}^n$ containing the unit Euclidean ball B, and the hyperplanes H tangent to B.

The Barker–Larman problem asks whether K must be a Euclidean ball if the sections by all these hyperplanes H have constant $n-1$ dimensional volume.

The problem for bodies of revolution in dimension $n = 4$ has a very special structure, and the answer is very likely NO.

We show a way to construct approximate counterexamples as solutions to a bifurcation equation in the space of periodic functions.