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Delaunay-type solutions for a fractional Laplacian equation arising in conformal geometry

We construct some ODE solutions for the fractional Yamabe problem in conformal geometry. The fractional curvature, a generalization of the usual scalar curvature, is defined from the conformal fractional Laplacian, which is a non-local operator constructed on the conformal infinity of a conformally compact Einstein manifold. These ODE solutions are a generalization of the usual Delaunay solutions and, in particular, solve the fractional Yamabe problem

$$(-\Delta)^{\gamma} u = c_{n,\gamma} u^{\frac{n+2\gamma}{n-2\gamma}}, u > 0 \text{ in } \mathbb{R}^n \setminus \{0\},$$

with an isolated singularity at the origin. This is a fractional order ODE for which new tools need to be developed. The key of the proof is the computation of the fractional Laplacian in polar coordinates.