

A NEW REVERSE ISOPERIMETRIC INEQUALITY AND ITS STABILITY

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Abstract. In this paper, we deal with the reverse isoperimetric inequality for a closed and strictly convex curve in the Euclidean plane \mathbb{R}^2 involving the following geometric functionals associated to the given convex curve: length, areas of the region respectively included by the curve and the locus of curvature centers, and the integral of the radius of curvature. In fact, a stronger and sharp version of the reverse isoperimetric inequality proved by Pan and Yang in [1] is established with a simple Fourier series proof. Furthermore, we investigate the stability property of such an inequality (almost equality implies that the curve is nearly circular).

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REFERENCES

- [1] S. L. PAN, J. N. YANG, *On a non-local perimeter-preserving curve evolution problem for convex plane curves*, Manuscripta Math. **127** (2008), 469–484.
- [2] J. STEINER, *Sur le maximum et le minimum des figures dans le plan, sur la sphère, et dans l'espace en général*, I and II, J. Reine Angew. Math. (Crelle) **24** (1842), 93–152 and 189–250.
- [3] S. L. PAN, H. ZHANG, *A reverse isoperimetric inequality for convex plane curves*, Beitrage Algebra Geom. **48** (2007), 303–308.
- [4] H. GROEMER, *Geometric applications of Fourier series and spherical harmonics*, Encyclopedia of Mathematics and its Applications, 61. Cambridge University Press, Cambridge, 1996.
- [5] S. L. PAN, H. P. XU, *Stability of a reverse isoperimetric inequality*, J. Math. Anal. Appl. **350** (2009), 348–353.