

## Refined inequalities for Euclidean moments of a domain with respect to its boundary

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### Abstract

Euclidean moments of simply connected plane domains are investigated. The moments are defined as the  $p$ th power of the  $L^p$ -norms of the distance function to the boundary of the domain. As was shown by Avkhadiev (1998) the Euclidean moment of inertia ( $p = 2$ ) gives two-sided estimates for the torsional rigidity of the domain. The estimate of the torsional rigidity connected with the domain area is the famous Saint-Venant-Pólya inequality, which was refined by Payne (1962). In this paper we obtain Payne-type inequalities for the Euclidean moments. A surprising fact is that new extremal domains, different from a disk, are found. © 2012 Society for Industrial and Applied Mathematics.

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### Keywords

Bonnesen's inequality, Euclidean moments of a domain with respect to its boundary, Isoperimetric inequality, Torsional rigidity