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Steklov eigenvalues of reflection-symmetric nearly-circular planar domains. Preliminary report.

We consider Steklov eigenvalues of reflection-symmetric, nearly-circular planar domains. Treating such domains as perturbations of the disk, we obtain a second-order formal asymptotic estimate in the domain perturbation parameter. We conclude with a discussion of implications for isoperimetric inequalities. Namely, our results corroborate the results of Weinstock and Brock which state, respectively, that the disk is the maximizer for the area and perimeter constrained problems. They also support the result of Hersch, Payne, and Schiffer that the product of the first two eigenvalues is maximal among all open planar sets of equal perimeter. In addition, our results imply that the disk is not the maximizer of the area constrained problems for higher even-numbered Steklov eigenvalues, as suggested by previous numerical results. (Received September 25, 2018)