ON THE LOCATION OF EIGENVALUES OF REAL MATRICES

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Abstract. The research in this paper is motivated by a recent work of I. Barany and J. Solymosi [I. Barany and J. Solymosi. Gershgorin disks for multiple eigenvalues of non-negative matrices. Preprint arXiv no. 1609.07439, 2016.] about the location of eigenvalues of nonnegative matrices with geometric multiplicity higher than one. In particular, an answer to a question posed by Barany and Solymosi, about how the location of the eigenvalues can be improved in terms of their geometric multiplicities is obtained. New inclusion sets for the eigenvalues of a real square matrix, called Geršgorin discs of the second type, are introduced. It is proved that under some conditions, an eigenvalue of a real matrix is in a Geršgorin disc of the second type. Some relationships between the geometric multiplicities of eigenvalues and these new inclusion sets are established. Some other related results, consequences, and examples are presented. The results presented here apply not only to nonnegative matrices, but extend to all real matrices, and some of them do not depend on the geometric multiplicity.

Key words. Real matrix, Eigenvalue, Geršgorin disc, Radius.

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