Homework 11

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Problem 4

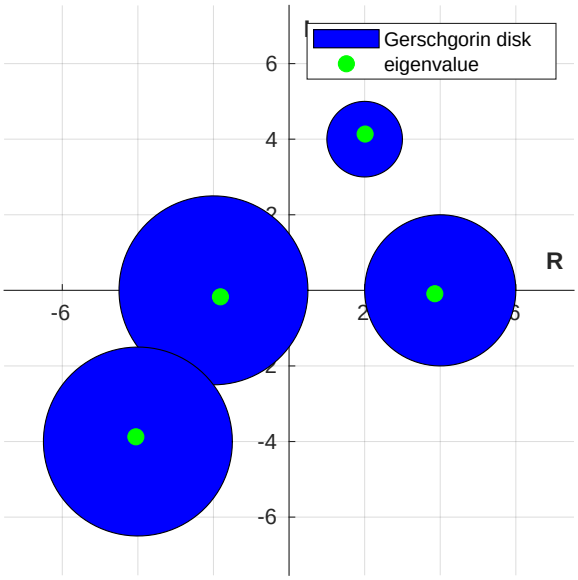

Figure 1: Gerschgorin disks with radius determined by absolute row sum

As expected, the eigenvalues plotted in green lie inside the Gerschgorin disks. Since none of the eigenvalues are equal to 0, the matrix A is invertible. However, not all the methods of obtaining the Gerschgorin disks lend themselves to that conclusion. In particular, since the origin is contained in the union of the disks of Figure 1 and Figure 3, we could not directly conclude from those methods that the matrix is invertible. However, Figure 2 utiliz-

ing the absolute column sums reveals that the matrix is in fact invertible, without having to calculate the eigenvalues beforehand.

Figure 3 seems to give the worst overall bounds on the eigenvalues, since all the disks are of a relatively large radius, whereas in Figure 1 and Figure 2 at least some of the disks are somewhat small.

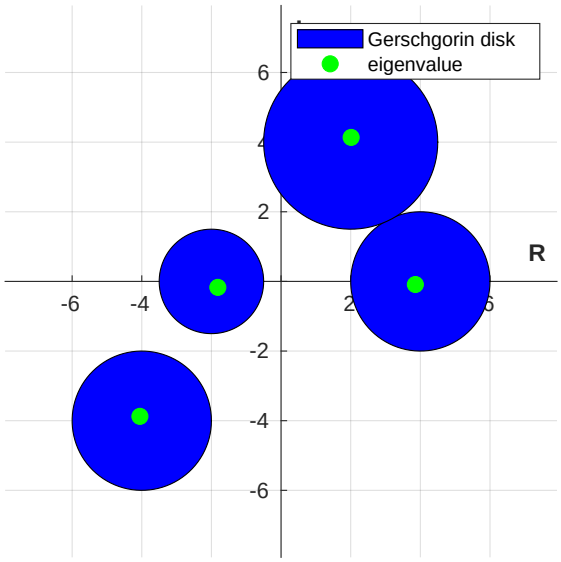

Figure 2: Gerschgorin disks with radius determined by absolute column sum

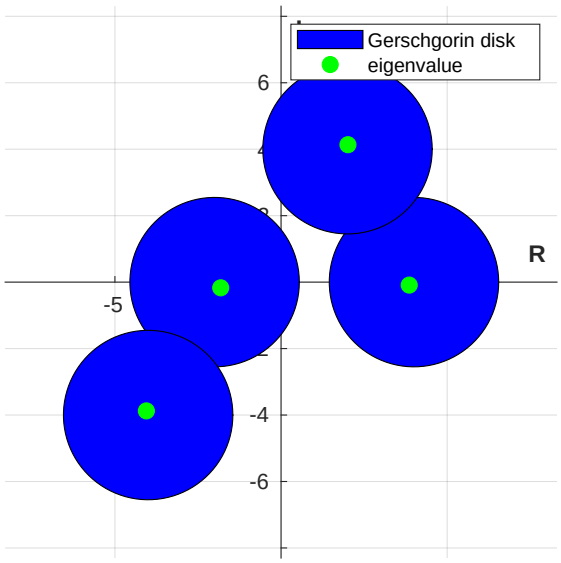

Figure 3: Gerschgorin disks with (constant) radius determined by Frobenius-norm-like method