

# Extreme eigenvalues of non-regular graphs

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## Abstract

Let  $\lambda_1$  be the greatest eigenvalue and  $\lambda_n$  the least eigenvalue of the adjacency matrix of a connected graph  $G$  with  $n$  vertices,  $m$  edges and diameter  $D$ . We prove that if  $G$  is nonregular, then

$$\Delta - \lambda_1 > \frac{n\Delta - 2m}{n(D(n\Delta - 2m) + 1)} \geq \frac{1}{n(D + 1)}$$

where  $\Delta$  is the maximum degree of  $G$ .

The inequality improves previous bounds of Stefanović and of Zhang. It also implies that a lower bound on  $\lambda_n$  obtained by Alon and Sudakov for (possibly regular) connected nonbipartite graphs also holds for connected nonregular graphs. This is joint work with David Gregory and Vlado Nikiforov.