On some classes of graphs whose second largest eigenvalue does not exceed $\frac{\sqrt{5}-1}{2}$

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Let λ_2 be the second largest eigenvalue of the adjacency matrix of a graph. We determine all trees and all bicyclic graphs for which λ_2 does not exceed $\frac{\sqrt{5}-1}{2}$. In description of these classes we use mappings that preserve $\operatorname{sgn}\left(\lambda_2 - \frac{\sqrt{5}-1}{2}\right)$.

On the geometric-arithmetic index

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Abstract. Let $G(k,n)$ be the set of connected simple n-vertex graphs with minimum vertex degree k. The geometric-arithmetic index $GA(G)$ of a graph G is defined by $GA(G) = \sum_{uv} \frac{2\sqrt{d_u d_v}}{d_u + d_v}$, where $d(u)$ is the degree of vertex u and the summation extends over all edges uv of G. In this paper we characterized graphs on which GA index attains minimum value, when number of vertices of degree k is $n-1$ and $n-2$. We also gave a conjecture about the extremal graphs on which this index attains its minimum value and lower bound for this index for graphs with given minimum degree k, where $k \leq \lfloor k_0 \rfloor$, $k_0 = q_0(n-1)$, $q_0 \approx 0.0874$ is the unique positive root of equation $q\sqrt{q} + q + 3\sqrt{q} - 1 = 0$.

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