

The finite k -set homogeneous graphs

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This is joint work with Cai Heng Li and Fu-Gang Yin

A classification is given of finite k -set-homogeneous graphs for $k \geq 2$, leading to a striking result that each finite k -set-homogeneous graph is k -homogeneous. It shows that 3-set-homogeneous graphs are rare, consisting of the following graphs and their complements: C_5 , $K_n \square K_n$, nK_m , the Schläfli graph of order 27, the Higman-Sims graph, the MaLaughlin graph, affine polar graphs, and elliptic orthogonal graphs. As an ingredient for the proof, it is shown that all orbitals in a primitive permutation group of rank 4 are self-paired, except for $PSU_3(3)$ acting on 36 points.

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