

Rich nowhere-zero flows

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A graph admits a nowhere-zero k -flow if its edges can be oriented and assigned values from the set $\{1, 2, \dots, k - 1\}$ in such a way that, at every vertex, the sum of the incoming values equals the sum of the outgoing values. The concept of a nowhere-zero flow is one of the most important concepts in graph theory and has been studied for more than half a century.

Recently a notion of a *rich* nowhere-zero k -flow, introduced by the speaker, attracted much attention: one where the values at every vertex are pairwise distinct in absolute value. We review known results and open problems of various authors in this area and connections to other problems. Among other things, we show that every bridgeless cubic graph admits a rich nowhere-zero 11-flow and conjecture that 6 in place of 11 will do. Also a linear upper bound for the rich flow number of a graph with bounded maximal degree will be discussed.