AN ORIENTED VERSION OF THE 1-2-3 CONJECTURE

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Abstract

The well-known 1-2-3 Conjecture addressed by Karoński, Łuczak and Thomason asks whether the edges of every undirected graph $G$ with no isolated edge can be assigned weights from $\{1, 2, 3\}$ so that the sum of incident weights at each vertex yields a proper vertex-colouring of $G$. In this work, we consider a similar problem for oriented graphs. We show that the arcs of every oriented graph $\overrightarrow{G}$ can be assigned weights from $\{1, 2, 3\}$ so that every two adjacent vertices of $\overrightarrow{G}$ receive distinct sums of outgoing weights. This result is tight in the sense that some oriented graphs do not admit such an assignment using the weights from $\{1, 2\}$ only. We finally prove that deciding whether two weights are sufficient for a given oriented graph is an NP-complete problem. These results also hold for product or list versions of this problem.

Keywords: oriented graph, neighbour-sum-distinguishing arc-weighting, complexity, 1-2-3 Conjecture.

2010 Mathematics Subject Classification: 68R10, 05C15.

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doi:10.1016/j.ipl.2008.01.006


doi:10.1016/j.jctb.2009.06.002

doi:10.1002/jgt.20354


doi:10.1016/j.jctb.2005.01.001

Received 8 October 2013
Revised 17 March 2014
Accepted 29 April 2014