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Improving Upper Bounds for the Distinguishing Index

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Improving Upper Bounds for the Distinguishing Index

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Abstract

The distinguishing index of a graph G, denoted by $D'(G)$, is the least number of colours in an edge colouring of G not preserved by any non-trivial automorphism. We characterize all connected graphs G with $D'(G) \geq \Delta(G)$. We show that $D'(G) \leq 2$ if G is a traceable graph of order at least seven, and $D'(G) \leq 3$ if G is either claw-free or 3-connected and planar. We also investigate the Nordhaus-Gaddum type relation: $2 \leq D'(G) + D'(\overline{G}) \leq \max\{\Delta(G), \Delta(\overline{G})\} + 2$ and we confirm it for some classes of graphs.

Keywords: edge colouring; symmetry breaking in graph; distinguishing index; claw-free graph, planar graph
Mathematics Subject Classifications: 05C05, 05C10, 05C15, 05C45

1 Introduction

We follow standard terminology and notation of graph theory (cf. [12]). In this paper, we consider general, i.e. not necessarily proper, edge colourings of graphs. Such a colouring f of a graph G *breaks an automorphism* $\varphi \in \mathrm{Aut}(G)$ if φ does not preserve colours of f. The *distinguishing index* $D'(G)$

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