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INCIDENCE COLORING—COLD CASES

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Abstract

An *incidence* in a graph G is a pair (v, e) where v is a vertex of G and e is an edge of G incident to v. Two incidences (v, e) and (u, f) are adjacent if at least one of the following holds: (i) $v = u$, (ii) $e = f$, or (iii) edge vu is from the set $\{e, f\}$. An *incidence coloring* of G is a coloring of its incidences assigning distinct colors to adjacent incidences. The minimum number of colors needed for incidence coloring of a graph is called the *incidence chromatic number*.

It was proved that at most $\Delta(G) + 5$ colors are enough for an incidence coloring of any planar graph G except for $\Delta(G) = 6$, in which case at most 12 colors are needed. It is also known that every planar graph G with girth at least 6 and $\Delta(G) \geq 5$ has incidence chromatic number at most $\Delta(G) + 2$.

In this paper we present some results on graphs regarding their maximum degree and maximum average degree. We improve the bound for planar graphs with $\Delta(G) = 6$. We show that the incidence chromatic number is at most $\Delta(G)+2$ for any graph G with $\mathrm{mad}(G) < 3$ and $\Delta(G) = 4$, and for any graph with $\mathrm{mad}(G) < \frac{10}{3}$ and $\Delta(G) \geq 8$.

Keywords: incidence coloring, incidence chromatic number, planar graph, maximum average degree.

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