

Research Notes - Chromatic Number of graphs with girth at least 4

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Theorem. *If G is triangle free, then $\chi(G) \leq O(\frac{\Delta}{\log \Delta})$*

Definition. A dichromatic colouring of a graph G is a colouring of the vertices so that no directed cycle is monochromatic.

For any digraph with no digons, is $\chi(D) \leq O(\frac{\Delta}{\log \Delta})$?

Theorem. *Suppose we have a partial colouring of a graph, and let L_v be the colours that can be assigned to the vertex v , and $T(v, c)$ the number of uncoloured neighbours of v with c in their list. If we have $|L_v| \geq L$, $T(v, c) \leq \frac{1}{8}L$, then the rest of the graph can be coloured.*

Proof. This uses the Lovazs local lemma. □