Acta Universitatis Carolinae. Mathematica et Physica

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Acta Universitatis Carolinae. Mathematica et Physica, Vol. 31 (1990), No. 2, 105

Persistent URL: http://dml.cz/dmlcz/701961

Neighborhoods in Line Graphs

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Received 11 March 1990

All graphs are finite, without loops and multiple edges.

If v is a nonisolated vertex of a graph then the *neighbourhood of* v is the subgraph of G induced by the set of vertices adjacent to v. If the neighbourhood of every vertex is isomorphic to a given graph H then G is called *locally* H *graph.*

Theorem. *Let* H *be a graph. Then either all locally* H *graphs are line graphs or none.*

Moreover the first case holds if H *is a complete graph or the union of two complete graphs or the union of two copies of the same complete graphs together with some independent edges joining them.*

Problem. Are there such graphs G and H with common vertex set that the neighbourhood of each vertex in graph G is isomorphic to its neighbourhood in a graph H, and G is a line graph while H not?

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