Isomorphisms Between Point-block Incidence Graphs

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A *point-block incidence graph* is a bipartite graph $G = (P, B)$ with a set of point vertices $P = \{p_1, p_2, ..., p_r\}$ and a set of blocks $B = \{B_1, B_2, ..., B_s\}$ where $p_i \in P$ is adjacent to $B_j \in B$ if and only if $p_i \in B_j$. We will consider point-block incidence graphs where the blocks have size 3 and are generated by a single triple $[a, b, c]$ with computations performed mod some integer k. We will consider conditions for two different point-block incidence graphs to be isomorphic. To help show two graphs are not isomorphic we will consider their *fixing* numbers which are defined as follows. A vertex v in a graph G is fixed if it is mapped to itself under every automorphism of G. The fixing number of a graph G is the minimum number of vertices, when fixed, fixes all of the vertices in G. In addition, we identify families of graphs with large fixing numbers and other where fixing any single vertex in the graph fixes all vertices in the graph.

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