Edge contraction and forbidden subgraphs

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Given a family of graphs $\mathcal{H}$, a graph G is $\mathcal{H}$-free if any subset of $V(G)$ does not induce a subgraph of G that is isomorphic to any graph in $\mathcal{H}$. The graph obtained from G by contracting an edge $e \in E(G)$ is denoted by G/e.

We introduce a general framework for the characterization of graph classes with respect to edge contractions. Specifically, we present sufficient and necessary conditions for a graph G such that G/e is $\mathcal{H}$-free for any edge e in $E(G)$. Thereafter, we use these conditions to characterize claw-free, $2K_2$-free, P_4-free, C_4-free, C_5-free, split, pseudo-split, threshold, matrogenic, gmatrogenic, and line graphs.