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Complete Solution to the TP$_2$-Completion Problem

A matrix is called TP$_2$ if all 1-by-1 and 2-by-2 minors are positive. The TP$_2$-completion problem asks which partial matrices have a TP$_2$-completion. For each given pattern of the specified entries, an explicit finite list of polynomial inequalities in the specified entries is given that characterizes the TP$_2$-completability of any partial matrix with that pattern. The method uses a generalized form of the Bruhat order on permutations, some new partial orders on matrices and the logarithmic method to reduce to the TP$_2$-completion problem to determining the generators of a certain finitely generated, pointed cone. An algorithm that finds these polynomial (in fact monomial) inequalities for a given pattern is given.