1 The Q-matrix completion problem

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A partial matrix is a matrix that contains some specified entries, while all other entries remain unspecified and can be freely assingned a value. An $n \times n$ partial matrix, B, specifies a digraph $D = (V_D, A_D)$, if $V_D = \{1, 2, \ldots, n\}$, and $(i, j) \in A_D$ if and only if the entry b_{ij} of B is specified. A real $n \times n$ matrix is a Q-matrix if for every $k = 1, 2, \ldots, n$, the sum of all $k \times k$ principal minors is positive. A partial matrix is a partial Q-matrix if the sum of all $k \times k$ principal minors is positive for every k for which all $k \times k$ principal matrices are fully specified. A digraph D is said to have Q-completion if every partial Q-matrix specifying D can be completed to a Q-matrix. In this presentation we give sufficient conditions for a digraph to have Q-completion, we also give necessary conditions for a digraph to have Q-completion, and characterize those digraphs of order at most four that have Q-completion.