Minimum rank of matrices described by a graph or pattern over the rational, real and complex numbers

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Abstract

We use a technique based on matroids to construct two nonzero patterns $Z_1$ and $Z_2$ such that the minimum rank of matrices described by $Z_1$ is less over the complex numbers than over the real numbers, and the minimum rank of matrices described by $Z_2$ is less over the real numbers than over the rational numbers. The latter example provides a counterexample to a conjecture in [AHKLR] about rational realization of minimum rank of sign patterns. Using $Z_1$ and $Z_2$, we construct symmetric patterns, equivalent to graphs $G_1$ and $G_2$, with the analogous minimum rank properties.