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The Gantmacher–Krein determinantal inequalities via planar networks

Gantmacher and Krein discovered a relation between the determinant of a totally nonnegative matrix and its partial Laplace expansions along the first row using Sylvester’s determinant identity. We shall present an alternate proof of the same using the re-parameterization of totally nonnegative matrices in terms of weighted acyclic directed planar networks, which is popularly known as the converse of Lindström’s lemma. To conclude, we shall articulate some of the outcomes of employing this method in related and ongoing work with Shaun Fallat.