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Critical exponents of graphs.

We study the set of powers that preserve positive semidefiniteness, when applied entrywise to matrices with structure of zeros prescribed by a graph. This is part of a broad program to study entrywise functions preserving positivity on distinguished submanifolds of the cone. In our main result, we completely classify the powers preserving positivity with respect to all chordal/decomposable graphs. Additionally, we introduce a new graph invariant which we call the “critical exponent”. Our results provide natural connections between combinatorics and analysis by relating the discrete sparsity structures of matrices to their spectral properties. (Received July 28, 2015)