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A generalized eigenvalue problem in the max-algebra

We consider the generalized eigenvalue problem

$$A \otimes x = \lambda B \otimes x, \quad x \geq 0, x \neq 0,$$

where A and B are (entrywise) nonnegative $n \times n$ matrices, and the "max" product $\otimes$ satisfies

$$(A \otimes x)_i := \max_{m=1}^{n} a_{im} x_m.$$

The case $B = I$ has been studied by several authors, and for irreducible (*e.g.*, positive) A there is exactly one eigenvalue λ in the above "max" sense.

The generalized problem is different, and for example neither existence nor uniqueness of eigenvalues is guaranteed, even for 2×2 positive matrices A and B. This case can be analysed by graphical methods, but for general n, degree theory turns out to be a more useful tool.