

Tropical Differential Equations

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Tropical differential equations are introduced. Similar to usual tropical algebraic equations which provide necessary conditions for solvability of systems of polynomial equations in Puiseux series, tropical differential equations express necessary conditions for solvability of systems of differential equations in power (or Hahn) series.

For a system of tropical linear differential equations we prove the existence of the minimal among its solutions. A polynomial complexity algorithm is designed for solving such systems. For tropical non-linear differential systems its NP-completeness is established.

Several open questions are supposed to be discussed and a recent partial answer to one of them by F. Aroca, C. Garay, Z. Toghiani who have established a fundamental theorem of tropical differential algebra, namely, that any (tropical) solution of the tropicalization of a differential ideal can be lifted to a power series solution of the ideal.