
q -Analogue of summability of formal solutions of linear q -difference-differential equations

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Abstract

Let $m \geq 1$, $q > 1$ and $\delta > 0$ be a real number. In this talk, I will consider the following q -difference-differential equations

$$\sum_{j+\delta|\alpha|\leq m} a_{j,\alpha}(t,z)(tD_q)^j \partial_z^\alpha X = F(t,z), \quad (\text{EQ})$$

with the unknown function $X = X(t,z)$, where $a_{j,\alpha}(t,z)$ ($j + \delta|\alpha| \leq m$) and $F(t,z)$ are holomorphic functions in a neighborhood of $(0,0) \in \mathbb{C}_t \times \mathbb{C}_z^d$

where we define q -difference operator D_q by

$$(D_q f)(t,z) = \frac{f(qt,z) - f(t,z)}{qt - t}.$$

The equation (EQ) has a formal solution which is q -summable in a suitable direction.

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