

> restart :

Load http://www.ccas.ru/ca/_media/lqrs.zip

Put two files from lqrs.zip to some directory, for example, to "/usr/userlib"

> libname := "/usr/userlib", libname :

>

$$\begin{aligned} > S := \begin{bmatrix} -\frac{q^2 x^2}{q x + 1} & -q x \\ -\frac{x (1 + q^2 x^2 + q (q^2 + 1) x)}{q x + 1} & -q^2 x - q x^2 \end{bmatrix} \cdot y(x) + \begin{bmatrix} \frac{q^2 x}{q^2 x + 1} & 1 \\ \frac{-1 + q^2 (q^2 + 1) x^2 + q^3 x}{q^2 x + 1} & x + q \end{bmatrix} \\ & \cdot y(q x) + \begin{bmatrix} 0 & 0 \\ q^2 & 0 \end{bmatrix} \cdot y(q^2 x) : \end{aligned}$$

> LqRS:-EG('lead', S, y(x));

$$\begin{aligned} & \begin{bmatrix} \frac{q^2 x^2}{q x + 1} & q x \\ -\frac{x (q^2 x^2 + 1 + q (q^2 + 1) x)}{q x + 1} & -q^2 x - q x^2 \end{bmatrix} \cdot y(x) + \begin{bmatrix} -\frac{q^4 x^2}{q^2 x + 1} - \frac{q^2 x}{q^2 x + 1} & -q^2 x - 1 \\ \frac{-1 + q^2 (q^2 + 1) x^2 + q^3 x}{q^2 x + 1} & x + q \end{bmatrix} \\ & \cdot y(q x) + \begin{bmatrix} \frac{q^3 x}{q^3 x + 1} & 1 \\ q^2 & 0 \end{bmatrix} \cdot y(q^2 x), \text{true} \end{aligned} \quad (1)$$

> LqRS:-LaurentSolution(S, y(x));

$$\begin{bmatrix} \frac{-c_1}{q^4} x^{-2} + O(x^{-1}) \\ O(x^{-1}) \end{bmatrix} \quad (2)$$

> LqRS:-LaurentSolution(S, y(x), 3);

$$\begin{bmatrix} \frac{-c_1}{q^4} x^{-2} + O(x^4) \\ -\frac{-c_1}{q^3} x^{-1} + \frac{-c_1}{q^2} + O(x) \end{bmatrix} \quad (3)$$

> LqRS:-PolynomialSolution(S, y(x));

$$\begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad (4)$$

> LqRS:-UniversalDenominator(S, y(x));

$$\frac{q}{x^2 (q x + 1)} \quad (5)$$

> LqRS:-RationalSolution(S, y(x));

$$\begin{bmatrix} -\frac{c_1}{x^2} \\ \frac{-c_1 q}{x (q x + 1)} \end{bmatrix} \quad (6)$$

> LqRS:-ResolvingSequence(S, y(x));

$$\begin{aligned} & [(q x^2 + q x) y_1(x) + (-q^3 x^2 - q^3 x - q^2 x - q x^2 + q x + q) y_1(q x) + (q^4 x + q^3 x^2 - q^3 x - q^3 - q \\ & - x) y_1(q^2 x) + (q^3 + q^2 x) y_1(q^3 x), -q x y_2(x) + y_2(q x)] \end{aligned} \quad (7)$$

> LqRS:-HypergeometricSolution(S, y(x), k);

$$\begin{bmatrix} -\frac{-c_1}{(q^k)^2} \\ \frac{-c_1 q}{q^k (q q^k + 1)} + -c_2 q^{\frac{1}{2} k^2 - \frac{1}{2} k} q^k \end{bmatrix}$$

(8)

>

$$\begin{aligned} > SI := \begin{bmatrix} -\frac{q^3}{(q x + 1)^2} & -\frac{q^2}{x (q x + 1)} \\ -\frac{q (q^2 x^2 + 1 + q (q^2 + 1) x)}{x (q x + 1)^2} & \frac{q (-q^2 x - q x^2)}{x^2 (q x + 1)} \end{bmatrix} \cdot z(x) \\ &+ \begin{bmatrix} \frac{q}{x (q^2 x + 1)^2} & \frac{1}{q x^2 (q^2 x + 1)} \\ \frac{-1 + q^2 (q^2 + 1) x^2 + q^3 x}{q x^2 (q^2 x + 1)^2} & \frac{x + q}{q x^2 (q^2 x + 1)} \end{bmatrix} \cdot z(q x) \\ &+ \begin{bmatrix} 0 & 0 \\ \frac{1}{q x^2 (q^3 x + 1)} & 0 \end{bmatrix} \cdot z(q^2 x) : \end{aligned}$$

> LqRS:-PolynomialSolution(SI, z(x));

$$\begin{bmatrix} -\frac{-c_1}{q} - x - c_1 \\ x - c_1 \end{bmatrix}$$

(9)

>