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> restart;
>
> syst :=  $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \cdot y(q^3 x) = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix} \cdot y(q^2 x) + \begin{bmatrix} 1 & -1 \\ x q & -2 q \end{bmatrix} \cdot y(x q) + \begin{bmatrix} x & q \\ 0 & 0 \end{bmatrix} \cdot y(x) :$ 
http://www.ccas.ru/ca/resolvingsequence
> read "resolvingsequence.mpl" :
> RS:-EG(syst, y(x), OreTools:-SetOreRing([x, q], 'qshift'));
 $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \cdot y(q^3 x) + \begin{bmatrix} 0 & q \\ -1 & -2 \end{bmatrix} \cdot y(q^2 x) + \begin{bmatrix} 0 & 0 \\ -x q & 2 q \end{bmatrix} \cdot y(x q) = 0$  (1)
> L := RS:-ResolvingSequence(syst, y(x), OreTools:-SetOreRing([x, q], 'qshift'));
 $L := [-q^2 x y_1(q^2 x) - y_1(q^3 x) + y_1(q^4 x) = 0, -q y_2(x q) + y_2(q^2 x) = 0]$  (2)
> value(QDifferenceEquations:-QHypergeometricSolution(L[2], y[2](x)));
 $\{q^n\}$  (3)
x=q^n, y(x) =  $\begin{bmatrix} 0 \\ q^n \end{bmatrix}$ :
>  $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 \\ q^{n+3} \end{bmatrix} = \text{simplify} \left( \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 0 \\ q^{n+2} \end{bmatrix} + \begin{bmatrix} 1 & -1 \\ q^n q & -2 q \end{bmatrix} \cdot \begin{bmatrix} 0 \\ q^{n+1} \end{bmatrix} + \begin{bmatrix} q^n & q \\ 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 \\ q^n \end{bmatrix} \right);$ 
 $\begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$  (4)
>
>
>
> QDifferenceEquations:-QHypergeometricSolution(L[1], y[1](x))
 $\{ \}$  (5)
>

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