meijerG, a package for simplification of Meijer's G function

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This note describes the meijerG package of REDUCE, which is able to do simplification of several cases of Meijer's G function. The simplifications are performed towards polynomials, elementary or special functions or (generalized) hypergeometric functions. Therefore this package should be used together with the REDUCE special function and hypergeometric (ghyper) package.

1 Introduction

The function

$$G_{pq}^{mn} \left(z \; \middle| \; \begin{matrix} (a_p) \\ (b_q) \end{matrix} \right)$$

has been studied by C. S. Meijer beginning in 1936 and has been called Meijer's G function later on. The complete definition of Meijer's G function can be found in [1]. Many well-known functions can be written as G functions,

e.g. exponentials, logarithms, trigonometric functions, Bessel functions and hypergeometric functions.

Several hundreds of particular values can be found in [1].

2   REDUCE operator meijerg

The operator `meijerg` expects 3 arguments, namely the list of upper parameters (which may be empty), the list of lower parameters (which may be empty too), and the argument.

The first element of the lists has to be the list of the first m or n resp. parameter, e.g.

To describe

$$G_{11}^{10}\left(x \ \middle| \ \begin{matrix} 1 \\ 0 \end{matrix}\right)$$

one has to write

```
MeijerG({{},1},{{0}},x); % and the result is:
```

```
 HEAVISIDE( - X + 1)
---------------------

      GAMMA(1)
```

and for

$$G_{02}^{10}\left(\begin{matrix} \frac{x^2}{4} \ \middle| \ \\ 1+\frac{1}{4} \ 1-\frac{1}{4} \end{matrix}\right)$$

```
MeijerG({{}},{{1+1/4},1-1/4},(x^2)/4) * sqrt pi;
```

```
                  1       2
 SQRT(PI)*BESSELJ(---,X)*X
                  2
---------------------------
```

4

Note: Using the special function package these results will be simplified further.

References

[1] A. P. Prudnikov, Yu. A. Brychkov, O. I. Marichev, *Integrals and Series, Volume 3: More special functions*, Gordon and Breach Science Publishers (1990).