laguerreA

`laguerreA(n, k, x)`

The laguerreA function returns the associated Laguerre polynomial of degree n (positive integer), index k (non-negative integer) and argument x. The associated Laguerre polynomials are defined by

$$L_n^k(x) = (-1)^k \frac{d^k}{dx^k}\left[L_{n+k}(x)\right],$$

where $L_{n+k}(x)$ is the Laguerre polynomial.

See Also

The **laguerre** and **laguerreGauss** functions.

References

Arfken, G., *Mathematical Methods for Physicists*, Academic Press, New York, 1985.

laguerreGauss

`laguerreGauss(p, m, r)`

The laguerreGauss function returns the normalized product of the associated Laguerre polynomials and a Gaussian. This function is typically encountered in solutions to physical problems where it represents the radial solution with an additional factor exp(i*m*ϕ) which is not included in this case. The LaguerreGauss is given by

$$U_{pm}(r) = \sqrt{\frac{2p!}{\pi(m+p)!}}\left(r\sqrt{2}\right)^m L_p^m\left(2r^2\right)\exp\left(-r^2\right).$$

See Also

The **laguerre**, **laguerreA**, and **hermiteGauss** functions.

LambertW

`LambertW(z, branch)`

The LambertW function returns the complex value of Lambert's W function for complex z and integer index *branch*. The function can be defined through its inverse,

$$z = w\,\mathrm{e}^w .$$

Since w is multivalued, the branch parameter is used to differentiate between solutions for the equation.

The LambertW function was added in Igor Pro 7.00.

Details

IGOR's LambertW uses complex input and output. You can use LambertW in real expressions but you must make sure that you are not calling the function in a range where its imaginary part is non-zero.

The average accuracy of the function defined by cabs(*z*-w*exp(w)) in the region |real(*z*)|<10, |imag(*z*)|<10 is 5e-14. In general the accuracy decreases with increasing |branch| and with increasing distance from the origin in the z-plane.

IGOR uses a hybrid algorithm to compute the function which requires longer computation times in the presence of numerical instabilities.

References

R.M. Corless, G.H. Gonnet, D.E.G. Hare, D.J. Jeffrey and D.E. Knuth, "On Lambert W Function", Advances in Computational Mathematics 5: 329-359