

## NAG Library Chapter Contents

### D01 – Quadrature

D01 Chapter Introduction – a description of the Chapter and an overview of the algorithms available

| <b>Routine Name</b> | <b>Mark of Introduction</b> | <b>Purpose</b>  |
|---------------------|-----------------------------|---|
| D01AHF              | 8                           | nagf_quad_1d_fin_well<br>One-dimensional quadrature, adaptive, finite interval, strategy due to Patterson, suitable for well-behaved integrands               |
| D01AJF              | 8                           | nagf_quad_1d_fin_bad<br>One-dimensional quadrature, adaptive, finite interval, strategy due to Piessens and de Doncker, allowing for badly behaved integrands |
| D01AKF              | 8                           | nagf_quad_1d_fin_osc<br>One-dimensional quadrature, adaptive, finite interval, method suitable for oscillating functions                                      |
| D01ALF              | 8                           | nagf_quad_1d_fin_sing<br>One-dimensional quadrature, adaptive, finite interval, allowing for singularities at user-specified break-points                     |
| D01AMF              | 8                           | nagf_quad_1d_inf<br>One-dimensional quadrature, adaptive, infinite or semi-infinite interval  |
| D01ANF              | 8                           | nagf_quad_1d_fin_wtrig<br>One-dimensional quadrature, adaptive, finite interval, weight function $\cos(\omega x)$ or $\sin(\omega x)$                         |
| D01APF              | 8                           | nagf_quad_1d_fin_wsing<br>One-dimensional quadrature, adaptive, finite interval, weight function with end-point singularities of algebraico-logarithmic type  |
| D01AQF              | 8                           | nagf_quad_1d_fin_wcauchy<br>One-dimensional quadrature, adaptive, finite interval, weight function $1/(x - c)$ , Cauchy principal value (Hilbert transform)   |
| D01ARF              | 10                          | nagf_quad_1d_indef<br>One-dimensional quadrature, non-adaptive, finite interval with provision for indefinite integrals                                       |
| D01ASF              | 13                          | nagf_quad_1d_inf_wtrig<br>One-dimensional quadrature, adaptive, semi-infinite interval, weight function $\cos(\omega x)$ or $\sin(\omega x)$                  |
| D01ATF              | 13                          | nagf_quad_1d_fin_bad_vec<br>One-dimensional quadrature, adaptive, finite interval, variant of D01AJF efficient on vector machines                             |
| D01AUF              | 13                          | nagf_quad_1d_fin_osc_vec<br>One-dimensional quadrature, adaptive, finite interval, variant of D01AKF efficient on vector machines                             |
| D01BCF              | 8                           | nagf_quad_1d_gauss_wgen<br>Calculation of weights and abscissae for Gaussian quadrature rules, general choice of rule   |
| D01BDF              | 8                           | nagf_quad_1d_fin_smooth<br>One-dimensional quadrature, non-adaptive, finite interval  |
| D01DAF              | 5                           | nagf_quad_2d_fin<br>Two-dimensional quadrature, finite region   |
| D01EAF              | 12                          | nagf_quad_md_adapt_multi<br>Multidimensional adaptive quadrature over hyper-rectangle, multiple integrands  |
| D01ESF              | 25                          | nagf_quad_md_sgq_multi_vec<br>Multi-dimensional quadrature using sparse grids   |

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| D01FBF | 8  | nagf_quad_md_gauss<br>Multidimensional Gaussian quadrature over hyper-rectangle   |
| D01FCF | 8  | nagf_quad_md_adapt<br>Multidimensional adaptive quadrature over hyper-rectangle   |
| D01FDF | 10 | nagf_quad_md_sphere<br>Multidimensional quadrature, Sag–Szekeres method, general product region or $n$ -sphere  |
| D01GAF | 5  | nagf_quad_1d_data<br>One-dimensional quadrature, integration of function defined by data values, Gill–Miller method   |
| D01GBF | 10 | nagf_quad_md_mcarlo<br>Multidimensional quadrature over hyper-rectangle, Monte–Carlo method   |
| D01GCF | 10 | nagf_quad_md_numth<br>Multidimensional quadrature, general product region, number-theoretic method  |
| D01GDF | 14 | nagf_quad_md_numth_vec<br>Multidimensional quadrature, general product region, number-theoretic method, variant of D01GCF efficient on vector machines  |
| D01GYF | 10 | nagf_quad_md_numth_coeff_prime<br>Korobov optimal coefficients for use in D01GCF or D01GDF, when number of points is prime  |
| D01GZF | 10 | nagf_quad_md_numth_coeff_2prime<br>Korobov optimal coefficients for use in D01GCF or D01GDF, when number of points is product of two primes   |
| D01JAF | 10 | nagf_quad_md_sphere_bad<br>Multidimensional quadrature over an $n$ -sphere, allowing for badly behaved integrands   |
| D01PAF | 10 | nagf_quad_md_simplex<br>Multidimensional quadrature over an $n$ -simplex  |
| D01RAF | 24 | nagf_quad_1d_gen_vec_multi_rcomm<br>One-dimensional quadrature, adaptive, finite interval, multiple integrands, vectorized abscissae, reverse communication   |
| D01RBF | 24 | nagf_quad_withdraw_1d_gen_vec_multi_diagnostic<br>Diagnostic routine for D01RAF<br><b>Note:</b> this routine is scheduled for withdrawal at Mark 27, see Advice on Replacement Calls for Withdrawn/Superseded Routines for further information. |
| D01RCF | 24 | nagf_quad_1d_gen_vec_multi_dimreq<br>Determine required array dimensions for D01RAF   |
| D01RGF | 24 | nagf_quad_1d_fin_gonnet_vec<br>One-dimensional quadrature, adaptive, finite interval, strategy due to Gonnet, allowing for badly behaved integrands   |
| D01TBF | 24 | nagf_quad_1d_gauss_wres<br>Pre-computed weights and abscissae for Gaussian quadrature rules, restricted choice of rule  |
| D01TDF | 26 | nagf_quad_1d_gauss_wrec<br>Calculation of weights and abscissae for Gaussian quadrature rules, method of Golub and Welsch   |
| D01TEF | 26 | nagf_quad_1d_gauss_recm<br>Generates recursion coefficients needed by D01TDF to calculate a Gaussian quadrature rule  |
| D01UAF | 24 | nagf_quad_1d_gauss_vec<br>One-dimensional Gaussian quadrature, choice of weight functions (vectorized)  |
| D01UBF | 26 | nagf_quad_1d_inf_exp_wt<br>Non-automatic routine to evaluate $\int_0^\infty \exp(-x^2) f(x) dx$   |

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| D01ZKF | 24 | nagf_quad_opt_set<br>Option setting routine |
| D01ZLF | 24 | nagf_quad_opt_get<br>Option getting routine |

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