NAG Library Chapter Contents

D02 – Ordinary Differential Equations

D02 Chapter Introduction – a description of the Chapter and an overview of the algorithms available

D02M–N Sub-chapter Introduction

Routine Name	Mark of Introduction	Purpose
D02AGF	2	nagf_ode_bvp_shoot_genpar_intern Ordinary differential equations, boundary value problem, shooting and matching technique, allowing interior matching point, general parameters to be determined
D02BGF	7	nagf_ode_ivp_rkm_val_simple Ordinary differential equations, initial value problem, Runge–Kutta–Merson method, until a component attains given value (simple driver)
D02BHF	7	nagf_ode_ivp_rkm_zero_simple Ordinary differential equations, initial value problem, Runge–Kutta–Merson method, until function of solution is zero (simple driver)
D02BJF	18	nagf_ode_ivp_rk_zero_simple Ordinary differential equations, initial value problem, Runge–Kutta method, until function of solution is zero, integration over range with intermediate output (simple driver)
D02CJF	13	nagf_ode_ivp_adams_zero_simple Ordinary differential equations, initial value problem, Adams' method, until function of solution is zero, intermediate output (simple driver)
D02EJF	12	nagf_ode_ivp_bdf_zero_simple Ordinary differential equations, stiff initial value problem, backward differentiation formulae method, until function of solution is zero, intermediate output (simple driver)
D02GAF	8	nagf_ode_bvp_fd_nonlin_fixedbc Ordinary differential equations, boundary value problem, finite difference technique with deferred correction, simple nonlinear problem
D02GBF	8	nagf_ode_bvp_fd_lin_gen Ordinary differential equations, boundary value problem, finite difference technique with deferred correction, general linear problem
D02HAF	8	nagf_ode_bvp_shoot_bval Ordinary differential equations, boundary value problem, shooting and matching, boundary values to be determined
D02HBF	8	nagf_ode_bvp_shoot_genpar Ordinary differential equations, boundary value problem, shooting and matching, general parameters to be determined
D02JAF	8	nagf_ode_bvp_coll_nth Ordinary differential equations, boundary value problem, collocation and least squares, single nth-order linear equation
D02JBF	8	nagf_ode_bvp_coll_sys Ordinary differential equations, boundary value problem, collocation and least squares, system of first-order linear equations
D02KAF	7	nagf_ode_sl2_reg_finite Second-order Sturm–Liouville problem, regular system, finite range, eigenvalue only
D02KDF	7	nagf_ode_sl2_breaks_vals Second-order Sturm–Liouville problem, regular/singular system, finite/infinite range, eigenvalue only, user-specified break-points

D02KEF	8	nagf_ode_sl2_breaks_funs Second-order Sturm–Liouville problem, regular/singular system, finite/infinite range, eigenvalue and eigenfunction, user-specified break-points
D02LAF	13	nagf_ode_ivp_2nd_rkn Second-order ordinary differential equations, initial value problem, Runge–Kutta–Nystrom method
D02LXF	13	nagf_ode_ivp_2nd_rkn_setup Second-order ordinary differential equations, initial value problem, setup for D02LAF
D02LYF	13	nagf_ode_ivp_2nd_rkn_diag Second-order ordinary differential equations, initial value problem, diagnostics for D02LAF
D02LZF	13	nagf_ode_ivp_2nd_rkn_interp Second-order ordinary differential equations, initial value problem, interpolation for D02LAF
D02MCF	22	nagf_ode_dae_dassl_cont Implicit ordinary differential equations/DAEs, initial value problem, DASSL method continuation for D02NEF
D02MVF	14	nagf_ode_ivp_stiff_dassl Ordinary differential equations, initial value problem, DASSL method, setup for D02M–N routines
D02MWF	22	nagf_ode_dae_dassl_setup Implicit ordinary differential equations/DAEs, initial value problem, setup for D02NEF
D02MZF	14	nagf_ode_ivp_stiff_interp Ordinary differential equations, initial value problem, interpolation for D02M–N routines (all integration methods), natural interpolant
D02NBF	12	nagf_ode_ivp_stiff_exp_fulljac Explicit ordinary differential equations, stiff initial value problem, full Jacobian (comprehensive)
D02NCF	12	nagf_ode_ivp_stiff_exp_bandjac Explicit ordinary differential equations, stiff initial value problem, banded Jacobian (comprehensive)
D02NDF	12	nagf_ode_ivp_stiff_exp_sparjac Explicit ordinary differential equations, stiff initial value problem, sparse Jacobian (comprehensive)
D02NEF	22	nagf_ode_dae_dassl_gen Implicit ordinary differential equations/DAEs, initial value problem, DASSL method integrator
D02NGF	12	nagf_ode_ivp_stiff_imp_fulljac Implicit/algebraic ordinary differential equations, stiff initial value problem, full Jacobian (comprehensive)
D02NHF	12	nagf_ode_ivp_stiff_imp_bandjac Implicit/algebraic ordinary differential equations, stiff initial value problem, banded Jacobian (comprehensive)
D02NJF	12	nagf_ode_ivp_stiff_imp_sparjac Implicit/algebraic ordinary differential equations, stiff initial value problem, sparse Jacobian (comprehensive)
D02NMF	12	nagf_ode_ivp_stiff_exp_revcom Explicit ordinary differential equations, stiff initial value problem (reverse communication, comprehensive)
D02NNF	12	nagf_ode_ivp_stiff_imp_revcom Implicit/algebraic ordinary differential equations, stiff initial value problem (reverse communication, comprehensive)
D02NPF	22	nagf_ode_dae_dassl_linalg Implicit ordinary differential equations/DAEs, initial value problem linear algebra setup routine for D02NEF

D02NRF	12	nagf_ode_ivp_stiff_sparjac_enq Ordinary differential equations, initial value problem, for use with D02M–N routines, sparse Jacobian, enquiry routine
D02NSF	12	nagf_ode_ivp_stiff_fulljac_setup Ordinary differential equations, initial value problem, for use with D02M–N routines, full Jacobian, linear algebra set up
D02NTF	12	nagf_ode_ivp_stiff_bandjac_setup Ordinary differential equations, initial value problem, for use with D02M–N routines, banded Jacobian, linear algebra set up
D02NUF	12	nagf_ode_ivp_stiff_sparjac_setup Ordinary differential equations, initial value problem, for use with D02M–N routines, sparse Jacobian, linear algebra set up
D02NVF	12	nagf_ode_ivp_stiff_bdf Ordinary differential equations, initial value problem, backward differentiation formulae method, setup for D02M–N routines
D02NWF	12	nagf_ode_ivp_stiff_blend Ordinary differential equations, initial value problem, Blend method, setup for D02M–N routines
D02NXF	12	nagf_ode_ivp_stiff_sparjac_diag Ordinary differential equations, initial value problem, sparse Jacobian, linear algebra diagnostics, for use with D02M–N routines
D02NYF	12	nagf_ode_ivp_stiff_integ_diag Ordinary differential equations, initial value problem, integrator diagnostics, for use with D02M–N routines
D02NZF	12	nagf_ode_ivp_stiff_contin Ordinary differential equations, initial value problem, setup for continuation calls to integrator, for use with D02M–N routines
D02PEF	24	nagf_ode_ivp_rkts_range Ordinary differential equations, initial value problem, Runge–Kutta method, integration over range with output
D02PFF	24	nagf_ode_ivp_rkts_onestep Ordinary differential equations, initial value problem, Runge–Kutta method, integration over one step
D02PGF	26	nagf_ode_ivp_rk_step_revcomm Ordinary differential equations, initial value problem, Runge–Kutta method, integration by reverse communication
D02PHF	26	nagf_ode_ivp_rk_interp_setup Set up interpolant by reverse communication for solution and derivative evaluations at points within the range of the last integration step taken by D02PGF
D02PJF	26	nagf_ode_ivp_rk_interp_eval Evaluate interpolant, set up using D02PQF, to approximate solution and/or solution derivatives at a point within the range of the last integration step taken by D02PGF
D02PQF	24	nagf_ode_ivp_rkts_setup Ordinary differential equations, initial value problem, setup for D02PEF and D02PFF
D02PRF	24	nagf_ode_ivp_rkts_reset_tend Ordinary differential equations, initial value problem, resets end of range for D02PFF
D02PSF	24	nagf_ode_ivp_rkts_interp Ordinary differential equations, initial value problem, interpolation for D02PFF
D02PTF	24	nagf_ode_ivp_rkts_diag Ordinary differential equations, initial value problem, integration diagnostics for D02PEF and D02PFF
D02PUF	24	nagf_ode_ivp_rkts_errass Ordinary differential equations, initial value problem, error assessment diagnostics for D02PEF and D02PFF

D02QFF	13	nagf_ode_ivp_adams_roots Ordinary differential equations, initial value problem, Adams' method with root-finding (direct communication, comprehensive)
D02QGF	13	nagf_ode_ivp_adams_roots_revcom Ordinary differential equations, initial value problem, Adams' method with root-finding (reverse communication, comprehensive)
D02QWF	13	nagf_ode_ivp_adams_setup Ordinary differential equations, initial value problem, setup for D02QFF and D02QGF
D02QXF	13	nagf_ode_ivp_adams_diag Ordinary differential equations, initial value problem, diagnostics for D02QFF and D02QGF
D02QYF	13	nagf_ode_ivp_adams_rootdiag Ordinary differential equations, initial value problem, root-finding diagnostics for D02QFF and D02QGF
D02QZF	13	nagf_ode_ivp_adams_interp Ordinary differential equations, initial value problem, interpolation for D02QFF or D02QGF
D02RAF	8	nagf_ode_bvp_fd_nonlin_gen Ordinary differential equations, general nonlinear boundary value problem, finite difference technique with deferred correction, continuation facility
D02SAF	8	nagf_ode_bvp_shoot_genpar_algeq Ordinary differential equations, boundary value problem, shooting and matching technique, subject to extra algebraic equations, general parameters to be determined
D02TGF	8	nagf_ode_bvp_coll_nth_comp nth-order linear ordinary differential equations, boundary value problem, collocation and least squares
D02TKF	17	nagf_ode_withdraw_bvp_coll_nlin Ordinary differential equations, general nonlinear boundary value problem, collocation technique **Note**: this routine is scheduled for withdrawal at Mark 27, see Advice on Replacement Calls for Withdrawn/Superseded Routines for further information.
D02TLF	25	nagf_ode_bvp_coll_nlin_solve Ordinary differential equations, general nonlinear boundary value problem, collocation technique (thread safe)
D02TVF	17	nagf_ode_bvp_coll_nlin_setup Ordinary differential equations, general nonlinear boundary value problem, setup for D02TLF
D02TXF	17	nagf_ode_bvp_coll_nlin_contin Ordinary differential equations, general nonlinear boundary value problem, continuation facility for D02TLF
D02TYF	17	nagf_ode_bvp_coll_nlin_interp Ordinary differential equations, general nonlinear boundary value problem, interpolation for D02TLF
D02TZF	17	nagf_ode_bvp_coll_nlin_diag Ordinary differential equations, general nonlinear boundary value problem, diagnostics for D02TLF
D02UAF	23	nagf_ode_bvp_ps_lin_coeffs Coefficients of Chebyshev interpolating polynomial from function values on Chebyshev grid
D02UBF	23	nagf_ode_bvp_ps_lin_cgl_vals Function or low-order-derivative values on Chebyshev grid from coefficients of Chebyshev interpolating polynomial
D02UCF	23	nagf_ode_bvp_ps_lin_cgl_grid Chebyshev Gauss–Lobatto grid generation

D02UDF	23	nagf_ode_bvp_ps_lin_cgl_deriv Differentiate a function by the FFT using function values on Chebyshev grid
D02UEF	23	nagf_ode_bvp_ps_lin_solve Solve linear constant coefficient boundary value problem on Chebyshev grid, Integral formulation
D02UWF	23	nagf_ode_bvp_ps_lin_grid_vals Interpolate a function from Chebyshev grid to uniform grid using barycentric Lagrange interpolation
D02UYF	23	nagf_ode_bvp_ps_lin_quad_weights Clenshaw–Curtis quadrature weights for integration using computed Chebyshev coefficients
D02UZF	23	nagf_ode_bvp_ps_lin_cheb_eval Chebyshev polynomial evaluation, $T_k(x)$
D02XJF	12	nagf_ode_ivp_stiff_nat_interp Ordinary differential equations, initial value problem, interpolation for D02M–N routines (BLEND and BDF methods only), natural interpolant
D02XKF	12	nagf_ode_ivp_stiff_c1_interp Ordinary differential equations, initial value problem, interpolation for D02M–N routines, C^1 interpolant
D02ZAF	12	nagf_ode_ivp_stiff_errest Ordinary differential equations, initial value problem, weighted norm of local error estimate for D02M–N routines