

NAG Library Chapter Contents

S – Approximations of Special Functions

S Chapter Introduction

Routine Name	Mark of Introduction	Purpose
S01BAF	14	$\ln(1 + x)$
S01EAF	14	Complex exponential, e^z
S07AAF	1	$\tan x$
S09AAF	1	$\arcsin x$
S09ABF	3	$\arccos x$
S10AAF	3	$\tanh x$
S10ABF	4	$\sinh x$
S10ACF	4	$\cosh x$
S11AAF	4	$\operatorname{arctanh} x$
S11ABF	4	$\operatorname{arcsinh} x$
S11ACF	4	$\operatorname{arccosh} x$
S13AAF	1	Exponential integral $E_1(x)$
S13ACF	2	Cosine integral $\operatorname{Ci}(x)$
S13ADF	5	Sine integral $\operatorname{Si}(x)$
S14AAF	1	Gamma function
S14ABF	8	Log gamma function
S14ACF	14	$\psi(x) - \ln x$
S14ADF	14	Scaled derivatives of $\psi(x)$
S14AEF	20	Polygamma function $\psi^{(n)}(x)$ for real x
S14AFF	20	Polygamma function $\psi^{(n)}(z)$ for complex z
S14AGF	21	Logarithm of the gamma function $\ln \Gamma(z)$
S14BAF	14	Incomplete gamma functions $P(a, x)$ and $Q(a, x)$
S15ABF	3	Cumulative Normal distribution function $P(x)$
S15ACF	4	Complement of cumulative Normal distribution function $Q(x)$
S15ADF	4	Complement of error function $\operatorname{erfc}(x)$
S15AEF	4	Error function $\operatorname{erf}(x)$
S15AFF	7	Dawson's integral
S15AGF	22	Scaled complement of error function, $\operatorname{erfcx}(x)$
S15DDF	14	Scaled complex complement of error function, $\exp(-z^2) \operatorname{erfc}(-iz)$
S17ACF	1	Bessel function $Y_0(x)$

S17ADF	1	Bessel function $Y_1(x)$
S17AEF	5	Bessel function $J_0(x)$
S17AFF	5	Bessel function $J_1(x)$
S17AGF	8	Airy function $\text{Ai}(x)$
S17AHF	8	Airy function $\text{Bi}(x)$
S17AJF	8	Airy function $\text{Ai}'(x)$
S17AKF	8	Airy function $\text{Bi}'(x)$
S17ALF	20	Zeros of Bessel functions $J_\alpha(x)$, $J'_\alpha(x)$, $Y_\alpha(x)$ or $Y'_\alpha(x)$
S17DCF	13	Bessel functions $Y_{\nu+a}(z)$, $\text{real } a \geq 0$, complex z , $\nu = 0, 1, 2, \dots$
S17DEF	13	Bessel functions $J_{\nu+a}(z)$, $\text{real } a \geq 0$, complex z , $\nu = 0, 1, 2, \dots$
S17DGF	13	Airy functions $\text{Ai}(z)$ and $\text{Ai}'(z)$, complex z
S17DHF	13	Airy functions $\text{Bi}(z)$ and $\text{Bi}'(z)$, complex z
S17DLF	13	Hankel functions $H_{\nu+a}^{(j)}(z)$, $j = 1, 2$, $\text{real } a \geq 0$, complex z , $\nu = 0, 1, 2, \dots$
S18ACF	1	Modified Bessel function $K_0(x)$
S18ADF	1	Modified Bessel function $K_1(x)$
S18AEF	5	Modified Bessel function $I_0(x)$
S18AFF	5	Modified Bessel function $I_1(x)$
S18CCF	10	Scaled modified Bessel function $e^x K_0(x)$
S18CDF	10	Scaled modified Bessel function $e^x K_1(x)$
S18CEF	10	Scaled modified Bessel function $e^{- x } I_0(x)$
S18CFE	10	Scaled modified Bessel function $e^{- x } I_1(x)$
S18DCF	13	Modified Bessel functions $K_{\nu+a}(z)$, $\text{real } a \geq 0$, complex z , $\nu = 0, 1, 2, \dots$
S18DEF	13	Modified Bessel functions $I_{\nu+a}(z)$, $\text{real } a \geq 0$, complex z , $\nu = 0, 1, 2, \dots$
S18GKF	21	Bessel function of the 1st kind $J_{\alpha \pm n}(z)$
S19AAF	11	Kelvin function $\text{ber } x$
S19ABF	11	Kelvin function $\text{bei } x$
S19ACF	11	Kelvin function $\text{ker } x$
S19ADF	11	Kelvin function $\text{kei } x$
S20ACF	5	Fresnel integral $S(x)$
S20ADF	5	Fresnel integral $C(x)$
S21BAF	8	Degenerate symmetrised elliptic integral of 1st kind $R_C(x, y)$
S21BBF	8	Symmetrised elliptic integral of 1st kind $R_F(x, y, z)$
S21BCF	8	Symmetrised elliptic integral of 2nd kind $R_D(x, y, z)$
S21BDF	8	Symmetrised elliptic integral of 3rd kind $R_J(x, y, z, r)$
S21BEF	22	Elliptic integral of 1st kind, Legendre form, $F(\phi m)$
S21BFF	22	Elliptic integral of 2nd kind, Legendre form, $E(\phi m)$
S21BGF	22	Elliptic integral of 3rd kind, Legendre form, $\Pi(n; \phi m)$
S21BHF	22	Complete elliptic integral of 1st kind, Legendre form, $K(m)$

S21BJF	22	Complete elliptic integral of 2nd kind, Legendre form, $E(m)$
S21CAF	15	Jacobian elliptic functions sn, cn and dn of real argument
S21CBF	20	Jacobian elliptic functions sn, cn and dn of complex argument
S21CCF	20	Jacobian theta functions $\theta_k(x, q)$ of real argument
S21DAF	20	General elliptic integral of 2nd kind $F(z, k', a, b)$ of complex argument
S22AAF	20	Legendre functions of 1st kind $P_n^m(x)$ or $\overline{P}_n^m(x)$
S30AAF	22	Black–Scholes–Merton option pricing formula
S30ABF	22	Black–Scholes–Merton option pricing formula with Greeks
S30BAF	22	Floating-strike lookback option pricing formula
S30BBF	22	Floating-strike lookback option pricing formula with Greeks
S30CAF	22	Binary option: cash-or-nothing pricing formula
S30CBF	22	Binary option: cash-or-nothing pricing formula with Greeks
S30CCF	22	Binary option: asset-or-nothing pricing formula
S30CDF	22	Binary option: asset-or-nothing pricing formula with Greeks
S30FAF	22	Standard barrier option pricing formula
S30JAF	22	Jump-diffusion, Merton’s model, option pricing formula
S30JBF	22	Jump-diffusion, Merton’s model, option pricing formula with Greeks
S30NAF	22	Heston’s model option pricing formula
S30QCF	22	American option: Bjerksund and Stensland pricing formula
S30SAF	22	Asian option: geometric continuous average rate pricing formula
S30SBF	22	Asian option: geometric continuous average rate pricing formula with Greeks
