

Numerical Recipes Subroutines and Functions

This page gives access to the individual Numerical Recipes (that is, subroutines and functions). Scroll down this page and click the left mouse button on any particular Recipe that you want to **view**, **print**, or **save to disk**. (Note: Be sure to initialize your path with the Set Path button before you save any files to disk.)

We do not recommend copying all the Recipes to disk in bulk. ([Here is why.](#)) Instead, we recommend copying just those Recipes that you need for a specific project, directly into the working directory for that project. However, if you really want to copy all the Recipes to a single directory, here is how:

1. Set your path using the Set Path button on the button bar.
2. Click here: [Copy all Subroutines and Functions to Disk](#)

LIST OF NUMERICAL RECIPES

ADDINT.FOR	interpolate and add, used by mglin [19.6]
AIRY.FOR	Airy functions [6.7]
AMEBSA.FOR	simulated annealing in continuous spaces [10.9]
AMOEB.A.FOR	minimize in N-dimensions by downhill simplex method [10.4]
AMOTRY.FOR	evaluate a trial point, used by amoeba [10.4]
AMOTSA.FOR	evaluate a trial point, used by amebsa [10.9]
ANNEAL.FOR	traveling salesman problem by simulated annealing [10.9]
ANORM2.FOR	utility used by mgfas [19.6]
ARCM.AK.FOR	construct an arithmetic code [20.5]
ARCODE.FOR	encode or decode a character using arithmetic coding [20.5]
ARCSUM.FOR	add integer to byte string, used by arcode [20.5]
ASOLVE.FOR	used by linbcg for preconditioner [2.7]
ATIMES.FOR	used by linbcg for sparse multiplication [2.7]
AVEVAR.FOR	calculate mean and variance of a data set [14.2]
BADLUK.FOR	Friday the 13th when the moon is full [1.1]
BALANC.FOR	balance a nonsymmetric matrix [11.5]
BANBKS.FOR	band diagonal systems, backsubstitution [2.4]
BANDEC.FOR	band diagonal systems, decomposition [2.4]
BANMUL.FOR	multiply vector by band diagonal matrix [2.4]
BCUCOF.FOR	construct two-dimensional bicubic [3.6]
BCUINT.FOR	two-dimensional bicubic interpolation [3.6]
BESCHB.FOR	Chebyshev expansion used by bessjy [6.7]
BESSI0.FOR	modified Bessel function I ₀ [6.6]
BESSI1.FOR	modified Bessel function I ₁ [6.6]
BESSI.FOR	modified Bessel function I of integer order [6.6]
BESSIK.FOR	modified Bessel functions of fractional order [6.7]
BESSJ0.FOR	Bessel function J ₀ [6.5]
BESSJ1.FOR	Bessel function J ₁ [6.5]
BESSJ.FOR	Bessel function J of general integer order [6.5]
BESSJY.FOR	Bessel functions of fractional order [6.7]
BESSK0.FOR	modified Bessel function K ₀ [6.6]
BESSK1.FOR	modified Bessel function K ₁ [6.6]
BESSK.FOR	modified Bessel function K of integer order [6.6]
BESSY0.FOR	Bessel function Y ₀ [6.5]
BESSY1.FOR	Bessel function Y ₁ [6.5]
BESSY.FOR	Bessel function Y of general integer order [6.5]
BETA.FOR	beta function [6.1]
BETACF.FOR	continued fraction used by betai [6.4]
BETAI.FOR	incomplete beta function [6.4]
BICO.FOR	binomial coefficients function [6.1]
BKSUB.FOR	backsubstitution, used by SOLVDE [17.3]
BNLDEV.FOR	binomial distributed random deviates [7.3]
BRENT.FOR	find minimum of a function by Brent's method [10.2]

BROYDN.FOR	secant method for systems of equations [9.7]
BSSTEP.FOR	integrate ODEs, Bulirsch-Stoer step [16.4]
CALDAT.FOR	calendar date from Julian day number [1.1]
CHDER.FOR	derivative of a function already Chebyshev fitted [5.9]
CHEBEV.FOR	Chebyshev polynomial evaluation [5.8]
CHEBFT.FOR	fit a Chebyshev polynomial to a function [5.8]
CHEBPC.FOR	polynomial coefficients from a Chebyshev fit [5.10]
CHINT.FOR	integrate a function already Chebyshev fitted [5.9]
CHIXY.FOR	used by fitexy to calculate a χ^2 [15.3]
CHOLDC.FOR	Cholesky decomposition [2.9]
CHOLSL.FOR	Cholesky backsubstitution [2.9]
CHSONE.FOR	chi-square test for difference between data and model [14.3]
CHSTWO.FOR	chi-square test for difference between two data sets [14.3]
CISI.FOR	cosine and sine integrals C_i and S_i [6.9]
CNTAB1.FOR	contingency table analysis using chi-square [14.4]
CNTAB2.FOR	contingency table analysis using entropy measure [14.4]
CONVLV.FOR	convolution or deconvolution of data using FFT [13.1]
COPY.FOR	utility used by mglin , mgfas [19.6]
CORREL.FOR	correlation or autocorrelation of data using FFT [13.2]
COSFT1.FOR	fast cosine transform with endpoints [12.3]
COSFT2.FOR	"staggered" fast cosine transform [12.3]
COVSRT.FOR	rearrange covariance matrix, used by lfit [15.4]
CRANK.FOR	replaces array elements by their rank [14.6]
CYCLIC.FOR	solution of cyclic tridiagonal systems [2.7]
DAUB4.FOR	Daubechies 4-coefficient wavelet filter [13.10]
DAWSON.FOR	Dawson's integral [6.10]
DBRENT.FOR	find minimum of a function using derivative information [10.3]
DDPOLY.FOR	evaluate a polynomial and its derivatives [5.3]
DECCHK.FOR	decimal check digit calculation or verification [20.3]
DERIVS.FOR	sample derivatives routine for stiff [16.6]
DF1DIM.FOR	alternative function used by linmin [10.6]
DFPMIN.FOR	minimize in N-dimensions by variable metric method [10.7]
DFRIDR.FOR	numerical derivative by Ridders' method [5.7]
DFTCOR.FOR	compute endpoint corrections for Fourier integrals [13.9]
DFTINT.FOR	high-accuracy Fourier integrals [13.9]
DIFEQ.FOR	spheroidal matrix coefficients, used by SFROID [17.4]
ECLASS.FOR	determine equivalence classes from list [8.6]
ECLAZZ.FOR	determine equivalence classes from procedure [8.6]
EI.FOR	exponential integral E_i [6.3]
EIGSRT.FOR	eigenvectors, sorts into order by eigenvalue [11.1]
ELLE.FOR	Legendre elliptic integral of the second kind [6.11]
ELLF.FOR	Legendre elliptic integral of the first kind [6.11]
ELLPI.FOR	Legendre elliptic integral of the third kind [6.11]
ELMHES.FOR	reduce a general matrix to Hessenberg form [11.5]
ERF.FOR	error function [6.2]
ERFC.FOR	complementary error function [6.2]
ERFCC.FOR	complementary error function, concise routine [6.2]
EULSUM.FOR	sum a series by Euler--van Wijngaarden algorithm [5.1]
EVLMEM.FOR	power spectral estimation from MEM coefficients [13.7]
EXPDEV.FOR	exponential random deviates [7.2]
EXPINT.FOR	exponential integral E_n [6.3]
F1DIM.FOR	function used by linmin [10.5]
FACTLN.FOR	logarithm of factorial function [6.1]
FACTRL.FOR	factorial function [6.1]
FASPER.FOR	power spectrum of unevenly sampled larger data sets [13.8]
FDJAC.FOR	finite-difference Jacobian, used by newt [9.7]
FGAUSS.FOR	fit a sum of Gaussians using mrqmin [15.5]

FILL0.FOR	utility used by mglin [19.6]
FIT.FOR	least-squares fit data to a straight line [15.2]
FITEXY.FOR	fit data to a straight line, errors in both x and y [15.3]
FIXRTS.FOR	reflect roots of a polynomial into unit circle [13.6]
FLEG.FOR	fit a Legendre polynomial using lfit or svdfit [15.4]
FLMOON.FOR	calculate phases of the moon by date [1.0]
FMIN.FOR	norm of a vector function, used by newt [9.7]
FOUR1.FOR	fast Fourier transform (FFT) in one dimension [12.2]
FOUREW.FOR	rewind and permute files, used by fourfs [12.6]
FOURFS.FOR	FFT for huge data sets on external media [12.6]
FOURN.FOR	fast Fourier transform in multidimensions [12.4]
FPOLY.FOR	fit a polynomial using lfit or svdfit [15.4]
FRED2.FOR	solve linear Fredholm equations of the second kind [18.1]
FREDEX.FOR	example of solving a singular Fredholm equation [18.3]
FREDIN.FOR	interpolate solutions obtained with fred2 [18.1]
FRENEL.FOR	Fresnel integrals S(x) and C(x) [6.9]
FRPRMN.FOR	minimize in N-dimensions by conjugate gradient [10.6]
FTEST.FOR	F-test for difference of variances [14.2]
GAMDEV.FOR	gamma-law distribution random deviates [7.3]
GAMMLN.FOR	logarithm of gamma function [6.1]
GAMMP.FOR	incomplete gamma function [6.2]
GAMMQ.FOR	complement of incomplete gamma function [6.2]
GASDEV.FOR	normally distributed random deviates [7.2]
GAUCOF.FOR	quadrature weights from orthogonal polynomials [4.5]
GAUHER.FOR	Gauss-Hermite weights and abscissas [4.5]
GAUJAC.FOR	Gauss-Jacobi weights and abscissas [4.5]
GAULAG.FOR	Gauss-Laguerre weights and abscissas [4.5]
GAULEG.FOR	Gauss-Legendre weights and abscissas [4.5]
GAUSSJ.FOR	Gauss-Jordan matrix inversion and linear equation solution [2.1]
GCF.FOR	continued fraction used by gammp and gammq [6.2]
GOLDEN.FOR	find minimum of a function by golden section search [10.1]
GSER.FOR	series used by gammp and gammq [6.2]
HPSEL.FOR	find M largest values, without altering an array [8.5]
HPSORT.FOR	sort an array by heapsort method [8.3]
HQR.FOR	eigenvalues of a Hessenberg matrix [11.6]
HUFAPP.FOR	append bits to a Huffman code, used by hufmak [20.4]
HUFDEC.FOR	use Huffman code to decode and decompress a character [20.4]
HUFENC.FOR	use Huffman code to encode and compress a character [20.4]
HUFMAK.FOR	construct a Huffman code [20.4]
HUNT.FOR	search a table when calls are correlated [3.4]
HYPDRV.FOR	complex hypergeometric function, derivative of [6.12]
HYPGEO.FOR	complex hypergeometric function [6.12]
HYPSER.FOR	complex hypergeometric function, series evaluation [6.12]
ICRC1.FOR	cyclic redundancy checksum, used by icrc [20.3]
ICRC.FOR	cyclic redundancy checksum [20.3]
IGRAY.FOR	Gray code and its inverse [20.2]
INDEXX.FOR	construct an index for an array [8.4]
INTERP.FOR	bilinear prolongation, used by mglin , mgfas [19.6]
IRBIT1.FOR	random bit sequence [7.4]
IRBIT2.FOR	random bit sequence [7.4]
JACOBI.FOR	eigenvalues and eigenvectors of a symmetric matrix [11.1]
JACOBN.FOR	sample Jacobian routine for stiff [16.6]
JULDAY.FOR	Julian Day number from calendar date [1.1]
KENDL1.FOR	correlation between two data sets, Kendall's tau [14.6]
KENDL2.FOR	contingency table analysis using Kendall's tau [14.6]
KERMOM.FOR	sample routine for moments of a singular kernel [18.3]
KS2D1S.FOR	K--S test in two dimensions, data vs. model [14.7]

KS2D2S.FOR	K--S test in two dimensions, data vs. data [14.7]
KSONE.FOR	Kolmogorov-Smirnov test of data against model [14.3]
KSTWO.FOR	Kolmogorov-Smirnov test between two data sets [14.3]
LAGUER.FOR	find a root of a polynomial by Laguerre's method [9.5]
LFIT.FOR	general linear least-squares fit by normal equations [15.4]
LINBCG.FOR	biconjugate gradient solution of sparse systems [2.7]
LINMIN.FOR	minimum of a function along a ray in N-dimensions [10.5]
LNSRCH.FOR	search along a line, used by newt [9.7]
LOCATE.FOR	search an ordered table by bisection [3.4]
LOP.FOR	applies nonlinear operator, used by mgfas [19.6]
LUBKSB.FOR	linear equation solution, backsubstitution [2.3]
LUDCMP.FOR	linear equation solution, LU decomposition [2.3]
MACHAR.FOR	diagnose computer's floating arithmetic [20.1]
MALOC.FOR	memory allocation utility used by mglin , mgfas [19.6]
MATADD.FOR	utility used by mgfas [19.6]
MATSUB.FOR	utility used by mgfas [19.6]
MEDFIT.FOR	fit data to a straight line robustly, least absolute deviation [15.7]
MEMCOF.FOR	evaluate maximum entropy (MEM) coefficients [13.6]
METROP.FOR	Metropolis algorithm, used by anneal [10.9]
MGFAS.FOR	nonlinear elliptic PDE solved by multigrid method [19.6]
MGLIN.FOR	linear elliptic PDE solved by multigrid method [19.6]
MIDEXP.FOR	integrate a function that decreases exponentially [4.4]
MIDINF.FOR	integrate a function on a semi-infinite interval [4.4]
MIDPNT.FOR	extended midpoint rule [4.4]
MIDSQL.FOR	integrate a function with lower square-root singularity [4.4]
MIDSQU.FOR	integrate a function with upper square-root singularity [4.4]
MISER.FOR	recursive multidimensional Monte Carlo integration [7.8]
MMID.FOR	integrate ODEs by modified midpoint method [16.3]
MNBRAK.FOR	bracket the minimum of a function [10.1]
MNEWT.FOR	Newton's method for systems of equations [9.6]
MOMENT.FOR	calculate moments of a data set [14.1]
MP2DFR.FOR	multiple precision conversion to decimal base [20.6]
MPDIV.FOR	multiple precision divide and remainder [20.6]
MPINV.FOR	multiple precision reciprocal [20.6]
MPMUL.FOR	multiple precision multiply, using FFT methods [20.6]
MPOPS.FOR	multiple precision arithmetic, simpler operations [20.6]
MPPI.FOR	multiple precision example, compute many digits of pi [20.6]
MPROVE.FOR	linear equation solution, iterative improvement [2.5]
MPSQRT.FOR	multiple precision square root [20.6]
MRQCOF.FOR	used by mrqmin to evaluate coefficients [15.5]
MRQMIN.FOR	nonlinear least-squares fit, Marquardt's method [15.5]
NEWT.FOR	globally convergent multi-dimensional Newton's method [9.7]
ODEINT.FOR	integrate ODEs with accuracy monitoring [16.2]
ORTHOG.FOR	construct nonclassical orthogonal polynomials [4.5]
PADE.FOR	Pade approximant from power series coefficients [5.12]
PCCHEB.FOR	inverse of chebpc; use to economize power series [5.11]
PCSHFT.FOR	polynomial coefficients of a shifted polynomial [5.10]
PEARSN.FOR	Pearson's correlation between two data sets [14.5]
PERIOD.FOR	power spectrum of unevenly sampled data [13.8]
PIKSR2.FOR	sort two arrays by straight insertion [8.1]
PIKSRT.FOR	sort an array by straight insertion [8.1]
PINVS.FOR	diagonalize a sub-block, used by SOLVDE [17.3]
PLGNDP.FOR	Legendre polynomials, associated (spherical harmonics) [6.8]
POIDEV.FOR	Poisson distributed random deviates [7.3]
POLCOE.FOR	polynomial coefficients from table of values [3.5]
POLCOF.FOR	polynomial coefficients from table of values [3.5]
POLDIV.FOR	divide one polynomial by another [5.3]

POLIN2.FOR	two-dimensional polynomial interpolation [3.6]
POLINT.FOR	polynomial interpolation [3.1]
POWELL.FOR	minimize in N-dimensions by Powell's method [10.5]
PREDIC.FOR	linear prediction using MEM coefficients [13.6]
PROBKS.FOR	Kolmogorov-Smirnov probability function [14.3]
PSDES.FOR	"pseudo-DES" hashing of 64 bits [7.5]
PWT.FOR	partial wavelet transform [13.10]
PWTSET.FOR	initialize coefficients for pwt [13.10]
PYTHAG.FOR	calculate $(a^2+b^2)^{1/2}$ without overflow [2.6]
PZEXTR.FOR	polynomial extrapolation, used by bsstep [16.4]
QGAUS.FOR	integrate a function by Gaussian quadratures [4.5]
QRDCMP.FOR	QR decomposition [2.10]
QROMB.FOR	integrate using Romberg adaptive method [4.3]
QROMO.FOR	integrate using open Romberg adaptive method [4.4]
QROOT.FOR	complex or double root of a polynomial, Bairstow [9.5]
QRSOLV.FOR	QR backsubstitution [2.10]
QRUPDT.FOR	update a QR decomposition [2.10]
QSIMP.FOR	integrate using Simpson's rule [4.2]
QTRAP.FOR	integrate using trapezoidal rule [4.2]
QUAD3D.FOR	integrate a function over a three-dimensional space [4.6]
QUADCT.FOR	count points by quadrants, used by ks2d1s [14.7]
QUADMX.FOR	sample routine for a quadrature matrix [18.3]
QUADVL.FOR	quadrant probabilities, used by ks2d1s [14.7]
RAN0.FOR	random deviate by Park and Miller minimal standard [7.1]
RAN1.FOR	random deviate, minimal standard plus shuffle [7.1]
RAN2.FOR	random deviate by L'Ecuyer long period plus shuffle [7.1]
RAN3.FOR	random deviate by Knuth subtractive method [7.1]
RAN4.FOR	random deviates from DES-like hashing [7.5]
RANK.FOR	construct a rank table for an array [8.4]
RANPT.FOR	get random point, used by miser [7.8]
RATINT.FOR	rational function interpolation [3.2]
RATLSQ.FOR	rational fit by least-squares method [5.13]
RATVAL.FOR	evaluate a rational function [5.3]
RC.FOR	Carlson's degenerate elliptic integral [6.11]
RD.FOR	Carlson's elliptic integral of the second kind [6.11]
REALFT.FOR	fast Fourier transform of a single real function [12.3]
REBIN.FOR	sample rebinning used by vegas [7.8]
RED.FOR	reduce columns of a matrix, used by SOLVDE [17.3]
RELAX2.FOR	Gauss-Seidel relaxation, used by mgfas [19.6]
RELAX.FOR	Gauss-Seidel relaxation, used by mglin [19.6]
RESID.FOR	calculate residual, used by mglin [19.6]
REVCST.FOR	cost of a reversal, used by anneal [10.9]
REVERS.FOR	do a reversal, used by anneal [10.9]
RF.FOR	Carlson's elliptic integral of the first kind [6.11]
RJ.FOR	Carlson's elliptic integral of the third kind [6.11]
RK4.FOR	integrate one step of ODEs, fourth-order Runge-Kutta [16.1]
RKCK.FOR	Cash-Karp-Runge-Kutta step used by rkqs [16.2]
RKDUMB.FOR	integrate ODEs by fourth-order Runge-Kutta [16.1]
RKQS.FOR	integrate one step of ODEs with accuracy monitoring [16.2]
RLFT3.FOR	FFT of real data in two or three dimensions [12.5]
ROTATE.FOR	Jacobi rotation used by grupdt [2.10]
RSOLV.FOR	right triangular backsubstitution [2.10]
RSTRCT.FOR	half-weighting restriction, used by mglin , mgfas [19.6]
RTBIS.FOR	find root of a function by bisection [9.1]
RTFLSP.FOR	find root of a function by false-position [9.2]
RTNEWT.FOR	find root of a function by Newton-Raphson [9.4]
RTSAFE.FOR	find root of a function by Newton-Raphson and bisection [9.4]

RTSEC.FOR	find root of a function by secant method [9.2]
RZEXTR.FOR	rational function extrapolation, used by bsstep [16.4]
SAVGOL.FOR	Savitzky-Golay smoothing coefficients [14.8]
SCRSHO.FOR	graph a function to search for roots [9.0]
SELECT.FOR	find the Nth largest in an array [8.5]
SELIP.FOR	find the Nth largest, without altering an array [8.5]
SFROID.FOR	spheroidal functions by method of SOLVDE [17.4]
SHELL.FOR	sort an array by Shell's method [8.1]
SHOOT.FOR	solve two point boundary value problem by shooting [17.1]
SHOOTF.FOR	ditto, by shooting to a fitting point [17.2]
SIMP1.FOR	linear programming, used by simplx [10.8]
SIMP2.FOR	linear programming, used by simplx [10.8]
SIMP3.FOR	linear programming, used by simplx [10.8]
SIMPLX.FOR	linear programming maximization of a linear function [10.8]
SIMPR.FOR	integrate stiff ODEs by semi-implicit midpoint rule [16.6]
SINFT.FOR	fast sine transform [12.3]
SLVSM2.FOR	solve on coarsest grid, used by mgfas [19.6]
SLVSML.FOR	solve on coarsest grid, used by mglin [19.6]
SNCNDN.FOR	Jacobian elliptic functions [6.11]
SNRM.FOR	used by linbcg for vector norm [2.7]
SOBSEQ.FOR	Sobol's quasi-random sequence [7.7]
SOLVDE.FOR	two point boundary value problem, solve by relaxation [17.3]
SOR.FOR	elliptic PDE solved by successive overrelaxation method [19.5]
SORT2.FOR	sort two arrays by quicksort method [8.2]
SORT3.FOR	sort, use an index to sort 3 or more arrays [8.4]
SORT.FOR	sort an array by quicksort method [8.2]
SPCTRM.FOR	power spectrum estimation using FFT [13.4]
SPEAR.FOR	Spearman's rank correlation between two data sets [14.6]
SPHBES.FOR	spherical Bessel functions j_n and y_n [6.7]
SPHEPT.FOR	spheroidal functions by method of shootf [17.4]
SPHOOT.FOR	spheroidal functions by method of shoot [17.4]
SPLIE2.FOR	construct two-dimensional spline [3.6]
SPLIN2.FOR	two-dimensional spline interpolation [3.6]
SPLINE.FOR	construct a cubic spline [3.3]
SPLINT.FOR	cubic spline interpolation [3.3]
SPREAD.FOR	extrapolate value into array, used by fasper [13.8]
SPRSAX.FOR	product of sparse matrix and vector [2.7]
SPRSIN.FOR	convert matrix to sparse format [2.7]
SPRSPM.FOR	pattern multiply two sparse matrices [2.7]
SPRSTM.FOR	threshold multiply two sparse matrices [2.7]
SPRSTP.FOR	transpose of sparse matrix [2.7]
SPRSTX.FOR	product of transpose sparse matrix and vector [2.7]
STIFBS.FOR	integrate stiff ODEs, Bulirsch-Stoer step [16.6]
STIFF.FOR	integrate stiff ODEs by fourth-order Rosenbrock [16.6]
STOERM.FOR	integrate conservative second-order ODEs [16.5]
SVBKSB.FOR	singular value backsubstitution [2.6]
SVDCMP.FOR	singular value decomposition of a matrix [2.6]
SVDFIT.FOR	linear least-squares fit by singular value decomposition [15.4]
SVDVAR.FOR	variances from singular value decomposition [15.4]
TOEPLZ.FOR	solve Toeplitz systems [2.8]
TPTEST.FOR	Student's t-test for means, case of paired data [14.2]
TQLI.FOR	eigensolution of a symmetric tridiagonal matrix [11.3]
TRAPZD.FOR	trapezoidal rule [4.2]
TRED2.FOR	Householder reduction of a real, symmetric matrix [11.2]
TRIDAG.FOR	solution of tridiagonal systems [2.4]
TRNCST.FOR	cost of a transposition, used by anneal [10.9]
TRNSPT.FOR	do a transposition, used by anneal [10.9]

<u>TTEST.FOR</u>	Student's t-test for difference of means [14.2]
<u>TUTEST.FOR</u>	Student's t-test for means, case of unequal variances [14.2]
<u>TWOFFT.FOR</u>	fast Fourier transform of two real functions [12.3]
<u>VANDER.FOR</u>	solve Vandermonde systems [2.8]
<u>VEGAS.FOR</u>	adaptive multidimensional Monte Carlo integration [7.8]
<u>VOLTRA.FOR</u>	linear Volterra equations of the second kind [18.2]
<u>WT1.FOR</u>	one-dimensional discrete wavelet transform [13.10]
<u>WTN.FOR</u>	multidimensional discrete wavelet transform [13.10]
<u>WWGHTS.FOR</u>	quadrature weights for an arbitrarily singular kernel [18.3]
<u>ZBRAC.FOR</u>	outward search for brackets on roots [9.1]
<u>ZBRAK.FOR</u>	inward search for brackets on roots [9.1]
<u>ZBRENT.FOR</u>	find root of a function by Brent's method [9.3]
<u>ZRHQR.FOR</u>	roots of a polynomial by eigenvalue methods [9.5]
<u>ZRIDDR.FOR</u>	find root of a function by Ridders' method [9.2]
<u>ZROOTS.FOR</u>	roots of a polynomial by Laguerre's method with deflation [9.5]