PROB
Probability Density Functions

PROB is a C library which handles various discrete and continuous probability density functions (PDF's).

For a discrete variable X, PDF(X) is the probability that the value X will occur; for a continuous variable, PDF(X) is the probability density of X, that is, the probability of a value between X and X+dX is PDF(X) * dX.

The corresponding cumulative density functions or "CDF"'s are also handled. For a discrete or continuous variable, CDF(X) is the probability that the variable takes on a value less than or equal to X.

In some cases, the inverse of the CDF can easily be computed. If

```
X = CDF_INV ( P )
```

then we are asserting that the value **X** has a cumulative probability density function of **P**, in other words, the probability that the variable is less than or equal to **X** is **P**. If the CDF cannot be analytically inverted, there are simple ways to try to estimate the inverse. Depending on the PDF, these methods may be rapid and accurate, or not.

For most distributions, the *mean* or "average value" or "expected value" is also available. For a discrete variable, MEAN is simply the sum of the products X * PDF(X); for a continuous variable, MEAN is the integral of X * PDF(X) over the range. For the distributions covered here, the means are known beforehand, and no summation or integration is required.

For most distributions, the *variance* is available. For a discrete variable, the variance is the sum of the products (X - MEAN)^2 * PDF(X); for a continuous variable, the variance is the integral of (X - MEAN)^2 * PDF(X) over the range. The square root of the variance is known as the *standard deviation*. For the distributions covered here, the variances are often known beforehand, and no summation or integration is required.

For many of the distributions, it is possible to repeatedly request "samples", that is, a pseudorandom sequence of realizations of the PDF. These samples are always associated with an integer seed, which controls the calculation. Using the same seed as input will guarantee the same sample value on output. Ultimately, a random number generator must be invoked internally. In most cases, the current code will call a routine called **R8_RANDOM** or **I4_RANDOM**, each of which in turn calls a routine called **R8_UNIFORM_01**. You may prefer a different random number

generator for this purpose.

Licensing:

The computer code and data files described and made available on this web page are distributed under the GNU LGPL license.

Languages:

PROB is available in a C version and a C++ version and a FORTRAN77 version and a FORTRAN90 version and a MATLAB version.

Related Data and Programs:

ASA152, a C library which evaluates point and cumulative probabilities associated with the hypergeometric distribution; this is Applied Statistics Algorithm 152;

ASA226, a C library which evaluates the CDF of the noncentral Beta distribution.

ASA241, a C library which evaluates the percentage points of the normal distribution.

ASA243, a C library which evaluates the CDF of the noncentral T distribution.

ASA310, a C library which computes the CDF of the noncentral Beta distribution.

BETA_NC, a C library which evaluates the CDF of the noncentral Beta distribution.

CDFLIB, a C library which evaluates the cumulative density function (CDF), inverse CDF, and certain other inverse functions, for distributions including beta, binomial, chi-square, noncentral chi-square, F, noncentral F, gamma, negative binomial, normal, Poisson, and students T, by Barry Brown, James Lovato, Kathy Russell.

DISCRETE_PDF_SAMPLE_2D, a C program which demonstrates how to construct a Probability Density Function (PDF) from a table of sample data, and then to use that PDF to create new samples.

NORMAL, a C library which samples the normal distribution.

TEST_VALUES, a C library which contains sample values for a number of distributions.

TRUNCATED_NORMAL, a C library which works with the truncated normal distribution over [A,B], or [A,+oo) or (-oo,B], returning the probability density function (PDF), the cumulative density function (CDF), the inverse CDF, the mean, the variance, and sample values.

UNIFORM, a C library which samples the uniform distribution.

ZIGGURAT, a C program which generates points from a uniform, normal or exponential distribution, using the ziggurat method.

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Source Code:

- prob.c, the source code;
- prob.h, the include file;
- prob.sh, commands to compile the source code.

Examples and Tests:

- prob_prb.c, the calling program;
- prob_prb.sh, commands to compile, link and run the calling program;
- prob_prb_output.txt, the output file.

List of Routines:

- **ANGLE_CDF** evaluates the Angle CDF.
- **ANGLE_MEAN** returns the mean of the Angle PDF.
- **ANGLE_PDF** evaluates the Angle PDF.
- **ANGLIT_CDF** evaluates the Anglit CDF.
- **ANGLIT_CDF_INV** inverts the Anglit CDF.
- **ANGLIT_MEAN** returns the mean of the Anglit PDF.
- **ANGLIT_PDF** evaluates the Anglit PDF.
- **ANGLIT_SAMPLE** samples the Anglit PDF.
- **ANGLIT_VARIANCE** returns the variance of the Anglit PDF.
- **ARCSIN_CDF** evaluates the Arcsin CDF.
- **ARCSIN_CDF_INV** inverts the Arcsin CDF.
- **ARCSIN_CHECK** checks the parameter of the Arcsin CDF.
- **ARCSIN_MEAN** returns the mean of the Arcsin PDF.
- **ARCSIN_PDF** evaluates the Arcsin PDF.
- **ARCSIN_SAMPLE** samples the Arcsin PDF.
- **ARCSIN_VARIANCE** returns the variance of the Arcsin PDF.
- **BENFORD_PDF** returns the Benford probability of one or more significant digits.
- **BERNOULLI_CDF** evaluates the Bernoulli CDF.
- **BERNOULLI_CDF_INV** inverts the Bernoulli CDF.
- **BERNOULLI_CHECK** checks the parameter of the Bernoulli CDF.

- **BERNOULLI_MEAN** returns the mean of the Bernoulli PDF.
- **BERNOULLI_PDF** evaluates the Bernoulli PDF.
- **BERNOULLI_SAMPLE** samples the Bernoulli PDF.
- **BERNOULLI_VARIANCE** returns the variance of the Bernoulli PDF.
- **BESSEL_I0** evaluates the modified Bessel function I0.
- **BESSEL_I0_VALUES** returns some values of the I0 Bessel function.
- **BESSEL_I1** evaluates the Bessel I function of order I.
- **BESSEL_I1_VALUES** returns some values of the I1 Bessel function.
- **BESSEL_IX_VALUES** returns some values of the Ix Bessel function.
- **BETA** returns the value of the Beta function.
- **BETA_BINOMIAL_CDF** evaluates the Beta Binomial CDF.
- **BETA_BINOMIAL_CDF_INV** inverts the Beta Binomial CDF.
- **BETA_BINOMIAL_CHECK** checks the parameters of the Beta Binomial PDF.
- **BETA_BINOMIAL_MEAN** returns the mean of the Beta Binomial PDF.
- **BETA_BINOMIAL_PDF** evaluates the Beta Binomial PDF.
- **BETA_BINOMIAL_SAMPLE** samples the Beta Binomial CDF.
- **BETA_BINOMIAL_VARIANCE** returns the variance of the Beta Binomial PDF.
- **BETA_CDF** evaluates the Beta CDF.
- **BETA_CDF_INV** inverts the Beta CDF.
- **BETA_CDF_INV_OLD** inverts the Beta CDF.
- **BETA_CHECK** checks the parameters of the Beta PDF.
- **BETA_CDF_VALUES** returns some values of the Beta CDF.
- **BETA_INC** returns the value of the incomplete Beta function.
- **BETA_INC_VALUES** returns some values of the incomplete Beta function.
- **BETA_MEAN** returns the mean of the Beta PDF.
- **BETA_PDF** evaluates the Beta PDF.
- **BETA_SAMPLE** samples the Beta PDF.
- **BETA_VARIANCE** returns the variance of the Beta PDF.
- **BINOMIAL_CDF** evaluates the Binomial CDF.
- **BINOMIAL_CDF_VALUES** returns some values of the binomial CDF.
- **BINOMIAL_CDF_INV** inverts the Binomial CDF.
- **BINOMIAL_CHECK** checks the parameter of the Binomial PDF.
- **BINOMIAL_COEF** computes the Binomial coefficient C(N,K).
- **BINOMIAL_COEF_LOG** computes the logarithm of the Binomial coefficient.

- **BINOMIAL_MEAN** returns the mean of the Binomial PDF.
- **BINOMIAL_PDF** evaluates the Binomial PDF.
- **BINOMIAL_SAMPLE** samples the Binomial PDF.
- **BINOMIAL_VARIANCE** returns the variance of the Binomial PDF.
- **BIRTHDAY_CDF** returns the Birthday Concurrence CDF.
- **BIRTHDAY_CDF_INV** inverts the Birthday Concurrence CDF.
- **BIRTHDAY_PDF** returns the Birthday Concurrence PDF.
- **BRADFORD_CDF** evaluates the Bradford CDF.
- **BRADFORD_CDF_INV** inverts the Bradford CDF.
- **BRADFORD_CHECK** checks the parameters of the Bradford PDF.
- **BRADFORD_MEAN** returns the mean of the Bradford PDF.
- **BRADFORD_PDF** evaluates the Bradford PDF.
- **BRADFORD_SAMPLE** samples the Bradford PDF.
- **BRADFORD_VARIANCE** returns the variance of the Bradford PDF.
- **BUFFON_LAPLACE_PDF** evaluates the Buffon-Laplace PDF.
- **BUFFON_LAPLACE_SIMULATE** simulates a Buffon-Laplace needle experiment.
- **BUFFON_PDF** evaluates the Buffon PDF.
- **BUFFON_SIMULATE** simulates a Buffon needle experiment.
- **BURR_CDF** evaluates the Burr CDF.
- **BURR_CDF_INV** inverts the Burr CDF.
- **BURR_CHECK** checks the parameters of the Burr CDF.
- **BURR_MEAN** returns the mean of the Burr PDF.
- **BURR_PDF** evaluates the Burr PDF.
- **BURR_SAMPLE** samples the Burr PDF.
- **BURR_VARIANCE** returns the variance of the Burr PDF.
- **CARDIOID_CDF** evaluates the Cardioid CDF.
- **CARDIOID_CDF_INV** inverts the Cardioid CDF.
- **CARDIOID_CHECK** checks the parameters of the Cardioid CDF.
- **CARDIOID_MEAN** returns the mean of the Cardioid PDF.
- **CARDIOID_PDF** evaluates the Cardioid PDF.
- **CARDIOID_SAMPLE** samples the Cardioid PDF.
- **CARDIOID_VARIANCE** returns the variance of the Cardioid PDF.
- **CAUCHY_CDF** evaluates the Cauchy CDF.
- **CAUCHY_CDF_INV** inverts the Cauchy CDF.

- **CAUCHY_CDF_VALUES** returns some values of the Cauchy CDF.
- **CAUCHY_CHECK** checks the parameters of the Cauchy CDF.
- **CAUCHY_MEAN** returns the mean of the Cauchy PDF.
- **CAUCHY_PDF** evaluates the Cauchy PDF.
- **CAUCHY_SAMPLE** samples the Cauchy PDF.
- **CAUCHY_VARIANCE** returns the variance of the Cauchy PDF.
- **CHI_CDF** evaluates the Chi CDF.
- **CHI_CDF_INV** inverts the Chi CDF.
- **CHI_CHECK** checks the parameters of the Chi CDF.
- **CHI_MEAN** returns the mean of the Chi PDF.
- **CHI_PDF** evaluates the Chi PDF.
- **CHI_SAMPLE** samples the Chi PDF.
- **CHI_VARIANCE** returns the variance of the Chi PDF.
- **CHI_SQUARE_CDF** evaluates the Chi squared CDF.
- **CHI_SQUARE_CDF_INV** inverts the Chi squared PDF.
- **CHI_SQUARE_CDF_VALUES** returns some values of the Chi-Square CDF.
- **CHI_SQUARE_CHECK** checks the parameter of the central Chi squared PDF.
- **CHI_SQUARE_MEAN** returns the mean of the central Chi squared PDF.
- **CHI_SQUARE_PDF** evaluates the central Chi squared PDF.
- **CHI_SQUARE_SAMPLE** samples the central Chi squared PDF.
- **CHI_SQUARE_VARIANCE** returns the variance of the central Chi squared PDF.
- **CHI_SQUARE_NONCENTRAL_CDF_VALUES** returns values of the noncentral chi CDF.
- **CHI_SQUARE_NONCENTRAL_CHECK** checks the parameters of the noncentral Chi Squared PDF.
- **CHI_SQUARE_NONCENTRAL_MEAN** returns the mean of the noncentral Chi squared PDF.
- **CHI_SQUARE_NONCENTRAL_SAMPLE** samples the noncentral Chi squared PDF.
- **CHI_SQUARE_NONCENTRAL_VARIANCE** returns the variance of the noncentral Chi squared PDF.
- **CIRCLE_SAMPLE** samples points from a circle.
- **CIRCULAR_NORMAL_01_MEAN** returns the mean of the Circular Normal 01 PDF.
- **CIRCULAR_NORMAL_01_PDF** evaluates the Circular Normal 01 PDF.
- **CIRCULAR_NORMAL_01_SAMPLE** samples the Circular Normal 01 PDF.
- **CIRCULAR_NORMAL_01_VARIANCE** returns the variance of the Circular Normal 01 PDF.
- **CIRCULAR_NORMAL_MEAN** returns the mean of the Circular Normal PDF.
- **CIRCULAR_NORMAL_PDF** evaluates the Circular Normal PDF.
- **CIRCULAR_NORMAL_SAMPLE** samples the Circular Normal PDF.

- **CIRCULAR_NORMAL_VARIANCE** returns the variance of the Circular Normal PDF.
- **COMBINATORIAL** computes the binomial coefficient C(N,K).
- **COSINE_CDF** evaluates the Cosine CDF.
- **COSINE_CDF_INV** inverts the Cosine CDF.
- **COSINE_CHECK** checks the parameters of the Cosine CDF.
- **COSINE_MEAN** returns the mean of the Cosine PDF.
- **COSINE_PDF** evaluates the Cosine PDF.
- **COSINE_SAMPLE** samples the Cosine PDF.
- **COSINE_VARIANCE** returns the variance of the Cosine PDF.
- **COUPON_COMPLETE_PDF** evaluates the Complete Coupon Collection PDF.
- **COUPON_MEAN** returns the mean of the Coupon PDF.
- **COUPON_SIMULATE** simulates the coupon collector's problem.
- **COUPON_VARIANCE** returns the variance of the Coupon PDF.
- **DERANGED_CDF** evaluates the Deranged CDF.
- **DERANGED_CDF_INV** inverts the Deranged CDF.
- **DERANGED_CHECK** checks the parameter of the Deranged PDF.
- **DERANGED_ENUM** returns the number of derangements of N objects.
- **DERANGED_MEAN** returns the mean of the Deranged CDF.
- **DERANGED_PDF** evaluates the Deranged PDF.
- **DERANGED_SAMPLE** samples the Deranged PDF.
- **DERANGED_VARIANCE** returns the variance of the Deranged CDF.
- **DIGAMMA** calculates the digamma or Psi function.
- **DIPOLE_CDF** evaluates the Dipole CDF.
- **DIPOLE_CDF_INV** inverts the Dipole CDF.
- **DIPOLE_CHECK** checks the parameters of the Dipole CDF.
- **DIPOLE_PDF** evaluates the Dipole PDF.
- **DIPOLE_SAMPLE** samples the Dipole PDF.
- **DIRICHLET_CHECK** checks the parameters of the Dirichlet PDF.
- **DIRICHLET_MEAN** returns the means of the Dirichlet PDF.
- **DIRICHLET_MOMENT2** returns the second moments of the Dirichlet PDF.
- **DIRICHLET_PDF** evaluates the Dirichlet PDF.
- **DIRICHLET_SAMPLE** samples the Dirichlet PDF.
- **DIRICHLET_VARIANCE** returns the variances of the Dirichlet PDF.
- **DIRICHLET_MIX_CHECK** checks the parameters of a Dirichlet mixture PDF.

- **DIRICHLET_MIX_MEAN** returns the means of a Dirichlet mixture PDF.
- **DIRICHLET_MIX_PDF** evaluates a Dirichlet mixture PDF.
- **DIRICHLET_MIX_SAMPLE** samples a Dirichlet mixture PDF.
- **DIRICHLET_MULTINOMIAL_PDF** evaluates a Dirichlet Multinomial PDF.
- **DISCRETE_CDF** evaluates the Discrete CDF.
- **DISCRETE_CDF_INV** inverts the Discrete CDF.
- **DISCRETE_CHECK** checks the parameters of the Discrete CDF.
- **DISCRETE_MEAN** evaluates the mean of the Discrete PDF.
- **DISCRETE_PDF** evaluates the Discrete PDF.
- **DISCRETE_SAMPLE** samples the Discrete PDF.
- **DISCRETE_VARIANCE** evaluates the variance of the Discrete PDF.
- **E_CONSTANT** returns the value of E.
- **EMPIRICAL_DISCRETE_CDF** evaluates the Empirical Discrete CDF.
- **EMPIRICAL_DISCRETE_CDF_INV** inverts the Empirical Discrete CDF.
- **EMPIRICAL_DISCRETE_CHECK** checks the parameters of the Empirical Discrete CDF.
- **EMPIRICAL_DISCRETE_MEAN** returns the mean of the Empirical Discrete PDF.
- **EMPIRICAL_DISCRETE_PDF** evaluates the Empirical Discrete PDF.
- **EMPIRICAL_DISCRETE_SAMPLE** samples the Empirical Discrete PDF.
- **EMPIRICAL_DISCRETE_VARIANCE** returns the variance of the Empirical Discrete PDF.
- **ENGLISH_SENTENCE_LENGTH_CDF** evaluates the English Sentence Length CDF.
- **ENGLISH_SENTENCE_LENGTH_CDF_INV** inverts the English Sentence Length CDF.
- **ENGLISH_SENTENCE_LENGTH_MEAN** evaluates the mean of the English Sentence Length PDF.
- **ENGLISH_SENTENCE_LENGTH_PDF** evaluates the English Sentence Length PDF.
- **ENGLISH_SENTENCE_LENGTH_SAMPLE** samples the English Sentence Length PDF.
- **ENGLISH_SENTENCE_LENGTH_VARIANCE:** variance of the English Sentence Length PDF.
- **ENGLISH_WORD_LENGTH_CDF** evaluates the English Word Length CDF.
- **ENGLISH_WORD_LENGTH_CDF_INV** inverts the English Word Length CDF.
- **ENGLISH_WORD_LENGTH_MEAN** evaluates the mean of the English Word Length PDF.
- **ENGLISH_WORD_LENGTH_PDF** evaluates the English Word Length PDF.
- **ENGLISH_WORD_LENGTH_SAMPLE** samples the English Word Length PDF.
- **ENGLISH_WORD_LENGTH_VARIANCE:** variance of the English Word Length PDF.
- **ERLANG_CDF** evaluates the Erlang CDF.
- **ERLANG_CDF_INV** inverts the Erlang CDF.
- **ERLANG_CHECK** checks the parameters of the Erlang PDF.

- **ERLANG_MEAN** returns the mean of the Erlang PDF.
- **ERLANG_PDF** evaluates the Erlang PDF.
- **ERLANG_SAMPLE** samples the Erlang PDF.
- **ERLANG_VARIANCE** returns the variance of the Erlang PDF.
- **ERROR_F** evaluates the error function ERF.
- **ERROR_F_INVERSE** inverts the error function ERF.
- **EULER_CONSTANT** returns the value of the Euler-Mascheroni constant.
- **EXPONENTIAL_01_CDF** evaluates the Exponential 01 CDF.
- **EXPONENTIAL_01_CDF_INV** inverts the Exponential 01 CDF.
- **EXPONENTIAL_01_MEAN** returns the mean of the Exponential 01 PDF.
- **EXPONENTIAL_01_PDF** evaluates the Exponential 01 PDF.
- **EXPONENTIAL_01_SAMPLE** samples the Exponential PDF with parameter 1.
- **EXPONENTIAL_01_VARIANCE** returns the variance of the Exponential 01 PDF.
- **EXPONENTIAL_CDF** evaluates the Exponential CDF.
- **EXPONENTIAL_CDF_INV** inverts the Exponential CDF.
- **EXPONENTIAL_CDF_VALUES** returns some values of the Exponential CDF.
- **EXPONENTIAL_CHECK** checks the parameters of the Exponential CDF.
- **EXPONENTIAL_MEAN** returns the mean of the Exponential PDF.
- **EXPONENTIAL_PDF** evaluates the Exponential PDF.
- **EXPONENTIAL_SAMPLE** samples the Exponential PDF.
- **EXPONENTIAL_VARIANCE** returns the variance of the Exponential PDF.
- **EXTREME_VALUES_CDF** evaluates the Extreme Values CDF.
- **EXTREME_VALUES_CDF_INV** inverts the Extreme Values CDF.
- **EXTREME_VALUES_CDF_VALUES** returns some values of the Extreme Values CDF.
- **EXTREME_VALUES_CHECK** checks the parameters of the Extreme Values CDF.
- **EXTREME_VALUES_MEAN** returns the mean of the Extreme Values PDF.
- **EXTREME_VALUES_PDF** evaluates the Extreme Values PDF.
- **EXTREME_VALUES_SAMPLE** samples the Extreme Values PDF.
- **EXTREME_VALUES_VARIANCE** returns the variance of the Extreme Values PDF.
- **F_CDF** evaluates the F central CDF.
- **F_CDF_VALUES** returns some values of the F CDF test function.
- **F_CHECK** checks the parameters of the F PDF.
- **F_MEAN** returns the mean of the F central PDF.
- **F_PDF** evaluates the F central PDF.

- **F_SAMPLE** samples the F central PDF.
- **F_VARIANCE** returns the variance of the F central PDF.
- **F_NONCENTRAL_CDF_VALUES** returns some values of the F CDF test function.
- **F_NONCENTRAL_CHECK** checks the parameters of the F noncentral PDF.
- **F_NONCENTRAL_MEAN** returns the mean of the F noncentral PDF.
- **F_NONCENTRAL_VARIANCE** returns the variance of the F noncentral PDF.
- **FACTORIAL_LOG** returns the logarithm of N!.
- **FACTORIAL_STIRLING** computes Stirling's approximation to N!.
- **FISHER_PDF** evaluates the Fisher PDF.
- **FISHER_SAMPLE** samples the Fisher distribution.
- **FISK_CDF** evaluates the Fisk CDF.
- **FISK_CDF_INV** inverts the Fisk CDF.
- **FISK_CHECK** checks the parameters of the Fisk PDF.
- **FISK_MEAN** returns the mean of the Fisk PDF.
- **FISK_PDF** evaluates the Fisk PDF.
- **FISK_SAMPLE** samples the Fisk PDF.
- **FISK_VARIANCE** returns the variance of the Fisk PDF.
- **FOLDED_NORMAL_CDF** evaluates the Folded Normal CDF.
- **FOLDED_NORMAL_CDF_INV** inverts the Folded Normal CDF.
- **FOLDED_NORMAL_CHECK** checks the parameters of the Folded Normal CDF.
- **FOLDED_NORMAL_MEAN** returns the mean of the Folded Normal PDF.
- **FOLDED_NORMAL_PDF** evaluates the Folded Normal PDF.
- **FOLDED_NORMAL_SAMPLE** samples the Folded Normal PDF.
- **FOLDED_NORMAL_VARIANCE** returns the variance of the Folded Normal PDF.
- **FRECHET_CDF** evaluates the Frechet CDF.
- **FRECHET_CDF_INV** inverts the Frechet CDF.
- **FRECHET_MEAN** returns the mean of the Frechet PDF.
- **FRECHET_PDF** evaluates the Frechet PDF.
- **FRECHET_SAMPLE** samples the Frechet PDF.
- **FRECHET_VARIANCE** returns the variance of the Frechet PDF.
- **GAMMA_CDF** evaluates the Gamma CDF.
- **GAMMA_CDF_VALUES** returns some values of the Gamma CDF.
- **GAMMA_CHECK** checks the parameters of the Gamma PDF.
- **GAMMA_MEAN** returns the mean of the Gamma PDF.

- **GAMMA_PDF** evaluates the Gamma PDF.
- **GAMMA_SAMPLE** samples the Gamma PDF.
- **GAMMA_VARIANCE** returns the variance of the Gamma PDF.
- **GAMMA_INC** computes the incomplete Gamma function.
- **GAMMA_INC_VALUES** returns some values of the incomplete Gamma function.
- **GAMMA_LOG** calculates the natural logarithm of GAMMA (X) for positive X.
- **GAMMA_LOG_INT** computes the logarithm of Gamma of an integer N.
- **GENLOGISTIC_CDF** evaluates the Generalized Logistic CDF.
- **GENLOGISTIC_CDF_INV** inverts the Generalized Logistic CDF.
- **GENLOGISTIC_CHECK** checks the parameters of the Generalized Logistic CDF.
- **GENLOGISTIC_MEAN** returns the mean of the Generalized Logistic PDF.
- **GENLOGISTIC_PDF** evaluates the Generalized Logistic PDF.
- **GENLOGISTIC_SAMPLE** samples the Generalized Logistic PDF.
- **GENLOGISTIC_VARIANCE** returns the variance of the Generalized Logistic PDF.
- **GEOMETRIC_CDF** evaluates the Geometric CDF.
- **GEOMETRIC_CDF_INV** inverts the Geometric CDF.
- **GEOMETRIC_CDF_VALUES** returns values of the geometric CDF.
- **GEOMETRIC_CHECK** checks the parameter of the Geometric CDF.
- **GEOMETRIC_MEAN** returns the mean of the Geometric PDF.
- **GEOMETRIC_PDF** evaluates the Geometric PDF.
- **GEOMETRIC_SAMPLE** samples the Geometric PDF.
- **GEOMETRIC_VARIANCE** returns the variance of the Geometric PDF.
- **GET_SEED** returns a random seed for the random number generator.
- **GOMPERTZ_CDF** evaluates the Gompertz CDF.
- **GOMPERTZ_CDF_INV** inverts the Gompertz CDF.
- **GOMPERTZ_CHECK** checks the parameters of the Gompertz PDF.
- **GOMPERTZ_PDF** evaluates the Gompertz PDF.
- **GOMPERTZ_SAMPLE** samples the Gompertz PDF.
- **GUMBEL_CDF** evaluates the Gumbel CDF.
- **GUMBEL_CDF_INV** inverts the Gumbel CDF.
- **GUMBEL_MEAN** returns the mean of the Gumbel PDF.
- **GUMBEL_PDF** evaluates the Gumbel PDF.
- **GUMBEL_SAMPLE** samples the Gumbel PDF.
- **GUMBEL_VARIANCE** returns the variance of the Gumbel PDF.

- **HALF_NORMAL_CDF** evaluates the Half Normal CDF.
- **HALF_NORMAL_CDF_INV** inverts the Half Normal CDF.
- **HALF_NORMAL_CHECK** checks the parameters of the Half Normal PDF.
- **HALF_NORMAL_MEAN** returns the mean of the Half Normal PDF.
- **HALF_NORMAL_PDF** evaluates the Half Normal PDF.
- **HALF_NORMAL_SAMPLE** samples the Half Normal PDF.
- **HALF_NORMAL_VARIANCE** returns the variance of the Half Normal PDF.
- **HYPERGEOMETRIC_CDF** evaluates the Hypergeometric CDF.
- **HYPERGEOMETRIC_CDF_VALUES** returns some values of the hypergeometric CDF.
- **HYPERGEOMETRIC_CHECK** checks the parameters of the Hypergeometric CDF.
- **HYPERGEOMETRIC_MEAN** returns the mean of the Hypergeometric PDF.
- **HYPERGEOMETRIC_PDF** evaluates the Hypergeometric PDF.
- **HYPERGEOMETRIC_SAMPLE** samples the Hypergeometric PDF.
- **HYPERGEOMETRIC_VARIANCE** returns the variance of the Hypergeometric PDF.
- **I4_FACTORIAL** returns N!.
- **I4_HUGE** returns a "huge" I4
- **I4_MAX** returns the maximum of two I4's.
- **I4_MIN** returns the smaller of two I4's.
- **I4_UNIFORM_AB** returns a scaled pseudorandom I4.
- **I4ROW_MAX** returns the maximums of an I4ROW.
- **I4ROW_MEAN** returns the means of an I4ROW.
- **I4ROW_MIN** returns the minimums of an I4ROW.
- **I4ROW_VARIANCE** returns the variances of an I4ROW.
- **I4VEC_MAX** returns the maximum of an I4VEC
- **I4VEC_MEAN** returns the mean of an I4VEC.
- **I4VEC_MIN** returns the minimum of an I4VEC.
- **I4VEC_PRINT** prints an I4VEC.
- **I4VEC_RUN_COUNT** counts runs of equal values in an I4VEC.
- **I4VEC_SUM** sums the entries of an I4VEC.
- **I4VEC_VARIANCE** returns the variance of an I4VEC.
- **INVERSE_GAUSSIAN_CDF** evaluates the Inverse Gaussian CDF.
- **INVERSE_GAUSSIAN_CHECK** checks the parameters of the Inverse Gaussian CDF.
- **INVERSE_GAUSSIAN_MEAN** returns the mean of the Inverse Gaussian PDF.
- **INVERSE_GAUSSIAN_PDF** evaluates the Inverse Gaussian PDF.

- **INVERSE_GAUSSIAN_SAMPLE** samples the Inverse Gaussian PDF.
- **INVERSE_GAUSSIAN_VARIANCE** returns the variance of the Inverse Gaussian PDF.
- **LAPLACE_CDF_VALUES** returns some values of the Laplace CDF.
- **LAPLACE_CDF** evaluates the Laplace CDF.
- **LAPLACE_CDF_INV** inverts the Laplace CDF.
- **LAPLACE_CHECK** checks the parameters of the Laplace PDF.
- **LAPLACE_MEAN** returns the mean of the Laplace PDF.
- **LAPLACE_PDF** evaluates the Laplace PDF.
- **LAPLACE_SAMPLE** samples the Laplace PDF.
- **LAPLACE_VARIANCE** returns the variance of the Laplace PDF.
- **LERCH** estimates the Lerch transcendent function.
- **LEVY_CDF** evaluates the Levy CDF.
- **LEVY_CDF_INV** inverts the Levy CDF.
- **LEVY_PDF** evaluates the Levy PDF.
- **LEVY_SAMPLE** samples the Levy PDF.
- **LOG_NORMAL_CDF** evaluates the Lognormal CDF.
- **LOG_NORMAL_CDF_INV** inverts the Lognormal CDF.
- **LOG_NORMAL_CDF_VALUES** returns some values of the Log Normal CDF.
- **LOG_NORMAL_CHECK** checks the parameters of the Lognormal PDF.
- **LOG_NORMAL_MEAN** returns the mean of the Lognormal PDF.
- **LOG_NORMAL_PDF** evaluates the Lognormal PDF.
- **LOG_NORMAL_SAMPLE** samples the Lognormal PDF.
- **LOG_NORMAL_VARIANCE** returns the variance of the Lognormal PDF.
- **LOG_SERIES_CDF** evaluates the Logarithmic Series CDF.
- **LOG_SERIES_CDF_INV** inverts the Logarithmic Series CDF.
- **LOG_SERIES_CDF_VALUES** returns some values of the log series CDF.
- **LOG_SERIES_CHECK** checks the parameter of the Logarithmic Series PDF.
- **LOG_SERIES_MEAN** returns the mean of the Logarithmic Series PDF.
- **LOG_SERIES_PDF** evaluates the Logarithmic Series PDF.
- **LOG_SERIES_SAMPLE** samples the Logarithmic Series PDF.
- **LOG_SERIES_VARIANCE** returns the variance of the Logarithmic Series PDF.
- **LOG_UNIFORM_CDF** evaluates the Log Uniform CDF.
- **LOG_UNIFORM_CDF_INV** inverts the Log Uniform CDF.
- **LOG_UNIFORM_CHECK** checks the parameters of the Log Uniform CDF.

- **LOG_UNIFORM_MEAN** returns the mean of the Log Uniform PDF.
- **LOG_UNIFORM_PDF** evaluates the Log Uniform PDF.
- **LOG_UNIFORM_SAMPLE** samples the Log Uniform PDF.
- **LOG_UNIFORM_VARIANCE** returns the variance of the Log Uniform PDF.
- **LOGISTIC_CDF** evaluates the Logistic CDF.
- **LOGISTIC_CDF_INV** inverts the Logistic CDF.
- **LOGISTIC_CDF_VALUES** returns some values of the Logistic CDF.
- **LOGISTIC_CHECK** checks the parameters of the Logistic CDF.
- **LOGISTIC_MEAN** returns the mean of the Logistic PDF.
- **LOGISTIC_PDF** evaluates the Logistic PDF.
- **LOGISTIC_SAMPLE** samples the Logistic PDF.
- **LOGISTIC_VARIANCE** returns the variance of the Logistic PDF.
- **LORENTZ_CDF** evaluates the Lorentz CDF.
- **LORENTZ_CDF_INV** inverts the Lorentz CDF.
- **LORENTZ_MEAN** returns the mean of the Lorentz PDF.
- **LORENTZ_PDF** evaluates the Lorentz PDF.
- **LORENTZ_SAMPLE** samples the Lorentz PDF.
- **LORENTZ_VARIANCE** returns the variance of the Lorentz PDF.
- **MAXWELL_CDF** evaluates the Maxwell CDF.
- **MAXWELL_CDF_INV** inverts the Maxwell CDF.
- **MAXWELL_CHECK** checks the parameters of the Maxwell CDF.
- **MAXWELL_MEAN** returns the mean of the Maxwell PDF.
- **MAXWELL_PDF** evaluates the Maxwell PDF.
- **MAXWELL_SAMPLE** samples the Maxwell PDF.
- **MAXWELL_VARIANCE** returns the variance of the Maxwell PDF.
- **MULTICOEF_CHECK** checks the parameters of the multinomial coefficient.
- **MULTINOMIAL_COEF1** computes a Multinomial coefficient.
- **MULTINOMIAL_COEF2** computes a Multinomial coefficient.
- **MULTINOMIAL_CHECK** checks the parameters of the Multinomial PDF.
- **MULTINOMIAL_COVARIANCE** returns the covariances of the Multinomial PDF.
- **MULTINOMIAL_MEAN** returns the means of the Multinomial PDF.
- **MULTINOMIAL_PDF** computes a Multinomial PDF.
- **MULTINOMIAL_SAMPLE** samples the Multinomial PDF.
- **MULTINOMIAL_VARIANCE** returns the variances of the Multinomial PDF.

- **MULTIVARIATE_NORMAL_SAMPLE** samples the Multivariate Normal PDF.
- **NAKAGAMI_CDF** evaluates the Nakagami CDF.
- **NAKAGAMI_CHECK** checks the parameters of the Nakagami PDF.
- **NAKAGAMI_MEAN** returns the mean of the Nakagami PDF.
- **NAKAGAMI_PDF** evaluates the Nakagami PDF.
- **NAKAGAMI_VARIANCE** returns the variance of the Nakagami PDF.
- **NEGATIVE_BINOMIAL_CDF** evaluates the Negative Binomial CDF.
- **NEGATIVE_BINOMIAL_CDF_INV** inverts the Negative Binomial CDF.
- **NEGATIVE_BINOMIAL_CDF_VALUES** returns values of the negative binomial CDF.
- **NEGATIVE_BINOMIAL_CHECK** checks parameters of the Negative Binomial PDF.
- **NEGATIVE_BINOMIAL_MEAN** returns the mean of the Negative Binomial PDF.
- **NEGATIVE_BINOMIAL_PDF** evaluates the Negative Binomial PDF.
- **NEGATIVE_BINOMIAL_SAMPLE** samples the Negative Binomial PDF.
- **NEGATIVE_BINOMIAL_VARIANCE** returns the variance of the Negative Binomial PDF.
- **NORMAL_01_CDF** evaluates the Normal 01 CDF.
- **NORMAL_01_CDF_INV** inverts the standard normal CDF.
- **NORMAL_01_CDF_VALUES** returns some values of the Normal 01 CDF.
- **NORMAL_01_MEAN** returns the mean of the Normal 01 PDF.
- **NORMAL_01_PDF** evaluates the Normal 01 PDF.
- **NORMAL_01_SAMPLE** samples the standard normal probability distribution.
- **NORMAL_01_VARIANCE** returns the variance of the Normal 01 PDF.
- **NORMAL_01_VECTOR** samples the standard normal probability distribution.
- **NORMAL_CDF** evaluates the Normal CDF.
- **NORMAL_CDF_INV** inverts the Normal CDF.
- **NORMAL_CDF_VALUES** returns some values of the Normal CDF.
- **NORMAL_CHECK** checks the parameters of the Normal PDF.
- **NORMAL_MEAN** returns the mean of the Normal PDF.
- **NORMAL_PDF** evaluates the Normal PDF.
- **NORMAL_SAMPLE** samples the Normal PDF.
- **NORMAL_VARIANCE** returns the variance of the Normal PDF.
- **NORMAL_VECTOR** samples the normal probability distribution.
- **NORMAL_TRUNCATED_AB_CDF** evaluates the truncated Normal CDF.
- **NORMAL_TRUNCATED_AB_CDF_INV** inverts the truncated Normal CDF.
- **NORMAL_TRUNCATED_AB_MEAN** returns the mean of the truncated Normal PDF.

- **NORMAL_TRUNCATED_AB_PDF** evaluates the truncated Normal PDF.
- **NORMAL_TRUNCATED_AB_SAMPLE** samples the truncated Normal PDF.
- **NORMAL_TRUNCATED_AB_VARIANCE** returns the variance of the truncated Normal PDF.
- **NORMAL_TRUNCATED_A_CDF** evaluates the lower truncated Normal CDF.
- **NORMAL_TRUNCATED_A_CDF_INV** inverts the lower truncated Normal CDF.
- **NORMAL_TRUNCATED_A_MEAN** returns the mean of the lower truncated Normal PDF.
- **NORMAL_TRUNCATED_A_PDF** evaluates the lower truncated Normal PDF.
- **NORMAL_TRUNCATED_A_SAMPLE** samples the lower truncated Normal PDF.
- **NORMAL_TRUNCATED_A_VARIANCE:** variance of the lower truncated Normal PDF.
- **NORMAL_TRUNCATED_B_CDF** evaluates the upper truncated Normal CDF.
- **NORMAL_TRUNCATED_B_CDF_INV** inverts the upper truncated Normal CDF.
- **NORMAL_TRUNCATED_B_MEAN** returns the mean of the upper truncated Normal PDF.
- **NORMAL_TRUNCATED_B_PDF** evaluates the upper truncated Normal PDF.
- **NORMAL_TRUNCATED_B_SAMPLE** samples the upper truncated Normal PDF.
- **NORMAL_TRUNCATED_B_VARIANCE:** variance of the upper truncated Normal PDF.
- **OWEN_VALUES** returns some values of Owen's T function.
- **PARETO_CDF** evaluates the Pareto CDF.
- **PARETO_CDF_INV** inverts the Pareto CDF.
- **PARETO_CHECK** checks the parameters of the Pareto CDF.
- **PARETO_MEAN** returns the mean of the Pareto PDF.
- **PARETO_PDF** evaluates the Pareto PDF.
- **PARETO_SAMPLE** samples the Pareto PDF.
- **PARETO_VARIANCE** returns the variance of the Pareto PDF.
- **PEARSON_05_CHECK** checks the parameters of the Pearson 5 PDF.
- **PEARSON_05_MEAN** evaluates the mean of the Pearson 5 PDF.
- **PEARSON_05_PDF** evaluates the Pearson 5 PDF.
- **PEARSON_05_SAMPLE** samples the Pearson 5 PDF.
- **PLANCK_CHECK** checks the parameters of the Planck PDF.
- **PLANCK_MEAN** returns the mean of the Planck PDF.
- **PLANCK_PDF** evaluates the Planck PDF.
- **PLANCK_SAMPLE** samples the Planck PDF.
- **PLANCK_VARIANCE** returns the variance of the Planck PDF.
- **POINT_DISTANCE_1D_PDF** evaluates the point distance PDF in 1D.
- **POINT_DISTANCE_2D_PDF** evaluates the point distance PDF in 2D.

- **POINT_DISTANCE_3D_PDF** evaluates the point distance PDF in the 3D.
- **POISSON_CDF** evaluates the Poisson CDF.
- **POISSON_CDF_INV** inverts the Poisson CDF.
- **POISSON_CDF_VALUES** returns some values of the Poisson CDF.
- **POISSON_CHECK** checks the parameter of the Poisson PDF.
- **POISSON_KERNEL** evaluates the Poisson kernel.
- **POISSON_MEAN** returns the mean of the Poisson PDF.
- **POISSON_PDF** evaluates the Poisson PDF.
- **POISSON_SAMPLE** samples the Poisson PDF.
- **POISSON_VARIANCE** returns the variance of the Poisson PDF.
- **POWER_CDF** evaluates the Power CDF.
- **POWER_CDF_INV** inverts the Power CDF.
- **POWER_CHECK** checks the parameter of the Power PDF.
- **POWER_MEAN** returns the mean of the Power PDF.
- **POWER_PDF** evaluates the Power PDF.
- **POWER_SAMPLE** samples the Power PDF.
- **POWER_VARIANCE** returns the variance of the Power PDF.
- **PSI_VALUES** returns some values of the Psi or Digamma function.
- **QUASIGEOMETRIC_CDF** evaluates the Quasigeometric CDF.
- **QUASIGEOMETRIC_CDF_INV** inverts the Quasigeometric CDF.
- **QUASIGEOMETRIC_CHECK** checks the parameters of the Quasigeometric CDF.
- **QUASIGEOMETRIC_MEAN** returns the mean of the Quasigeometric PDF.
- **QUASIGEOMETRIC_PDF** evaluates the Quasigeometric PDF.
- **QUASIGEOMETRIC_SAMPLE** samples the Quasigeometric PDF.
- **QUASIGEOMETRIC_VARIANCE** returns the variance of the Quasigeometric PDF.
- **R4_ABS** returns the absolute value of an R4.
- **R4_NINT** returns the nearest integer to an R4.
- **R4_UNIFORM_01** returns a real pseudorandom number.
- **R8_ABS** returns the absolute value of an R8.
- **R8_CEILING** rounds an R8 "up" to the nearest integer.
- **R8_CSC** returns the cosecant of X.
- **R8_EPSILON** returns the R8 round off unit.
- **R8_GAMMA** evaluates Gamma(X) for a real argument.
- **R8_HUGE** returns a "huge" R8.

- **R8_MAX** returns the maximum of two R8's.
- **R8_MIN** returns the minimum of two R8's.
- **R8_MODP** returns the nonnegative remainder of R8 division.
- **R8_NINT** returns the nearest integer to an R8.
- **R8_PI** returns the value of PI.
- **R8_RANDOM** returns a scaled pseudorandom R8.
- **R8_SIGN** returns the sign of an R8.
- **R8_UNIFORM_01** returns a unit pseudorandom R8.
- **R8MAT_PRINT** prints an R8MAT, with an optional title.
- **R8MAT_PRINT_SOME** prints some of an R8MAT.
- **R8POLY_VALUE** evaluates a double precision polynomial.
- **R8ROW_MAX** returns the maximums of an R8ROW.
- **R8ROW_MEAN** returns the means of an R8ROW.
- **R8ROW_MIN** returns the minimums of an R8ROW.
- **R8ROW_VARIANCE** returns the variances of an R8ROW.
- **R8VEC_CIRCULAR_VARIANCE** returns the circular variance of an R8VEC
- **R8VEC_DIFF_NORM** returns the L2 norm of the difference of R8VEC's.
- **R8VEC_DOT** computes the dot product of a pair of R8VEC's.
- **R8VEC_LENGTH** returns the Euclidean length of an R8VEC
- **R8VEC_MAX** returns the value of the maximum element in an R8VEC.
- **R8VEC_MEAN** returns the mean of an R8VEC.
- **R8VEC_MIN** returns the value of the minimum element in an R8VEC.
- **R8VEC_PRINT** prints an R8VEC
- **R8VEC_RANDOM** returns a scaled pseudorandom R8VEC.
- **R8VEC_SUM** returns the sum of an R8VEC.
- **R8VEC_UNIFORM_01** returns a unit pseudorandom R8VEC
- **R8VEC_UNIT_SUM** normalizes an R8VEC to have unit sum.
- **R8VEC_VARIANCE** returns the variance of an R8VEC.
- **RAYLEIGH_CDF** evaluates the Rayleigh CDF.
- **RAYLEIGH_CDF_INV** inverts the Rayleigh CDF.
- **RAYLEIGH_CDF_VALUES** returns some values of the Rayleigh CDF.
- **RAYLEIGH_CHECK** checks the parameter of the Rayleigh PDF.
- **RAYLEIGH_MEAN** returns the mean of the Rayleigh PDF.
- **RAYLEIGH_PDF** evaluates the Rayleigh PDF.

- **RAYLEIGH_SAMPLE** samples the Rayleigh PDF.
- **RAYLEIGH_VARIANCE** returns the variance of the Rayleigh PDF.
- **RECIPROCAL_CDF** evaluates the Reciprocal CDF.
- **RECIPROCAL_CDF_INV** inverts the Reciprocal CDF.
- **RECIPROCAL_CHECK** checks the parameters of the Reciprocal CDF.
- **RECIPROCAL_MEAN** returns the mean of the Reciprocal PDF.
- **RECIPROCAL_PDF** evaluates the Reciprocal PDF.
- **RECIPROCAL_SAMPLE** samples the Reciprocal PDF.
- **RECIPROCAL_VARIANCE** returns the variance of the Reciprocal PDF.
- **RIBESL** calculates I Bessel function with non-integer orders.
- **RUNS_MEAN** returns the mean of the Runs PDF.
- **RUNS_PDF** evaluates the Runs PDF.
- **RUNS_SAMPLE** samples the Runs PDF.
- **RUNS_SIMULATE** simulates a case governed by the Runs PDF.
- **RUNS_VARIANCE** returns the variance of the Runs PDF.
- **S_LEN_TRIM** returns the length of a string to the last nonblank.
- **SECH** returns the hyperbolic secant.
- **SECH_CDF** evaluates the Hyperbolic Secant CDF.
- **SECH_CDF_INV** inverts the Hyperbolic Secant CDF.
- **SECH_CHECK** checks the parameters of the Hyperbolic Secant CDF.
- **SECH_MEAN** returns the mean of the Hyperbolic Secant PDF.
- **SECH_PDF** evaluates the Hypebolic Secant PDF.
- **SECH_SAMPLE** samples the Hyperbolic Secant PDF.
- **SECH_VARIANCE** returns the variance of the Hyperbolic Secant PDF.
- **SEMICIRCULAR_CDF** evaluates the Semicircular CDF.
- **SEMICIRCULAR_CDF_INV** inverts the Semicircular CDF.
- **SEMICIRCULAR_CHECK** checks the parameters of the Semicircular CDF.
- **SEMICIRCULAR_MEAN** returns the mean of the Semicircular PDF.
- **SEMICIRCULAR_PDF** evaluates the Semicircular PDF.
- **SEMICIRCULAR_SAMPLE** samples the Semicircular PDF.
- **SEMICIRCULAR_VARIANCE** returns the variance of the Semicircular PDF.
- **SIN_POWER_INT** evaluates the sine power integral.
- **SPHERE_UNIT_AREA_ND** computes the surface area of a unit sphere in ND.
- **STIRLING2_VALUE** computes a Stirling number of the second kind.

- **STUDENT_CDF** evaluates the central Student T CDF.
- **STUDENT_CDF_VALUES** returns some values of the Student CDF.
- **STUDENT_CHECK** checks the parameter of the central Student T CDF.
- **STUDENT_MEAN** returns the mean of the central Student T PDF.
- **STUDENT_PDF** evaluates the central Student T PDF.
- **STUDENT_SAMPLE** samples the central Student T PDF.
- **STUDENT_VARIANCE** returns the variance of the central Student T PDF.
- **STUDENT_NONCENTRAL_CDF** evaluates the noncentral Student T CDF.
- **STUDENT_NONCENTRAL_CDF_VALUES** returns values of the noncentral Student CDF.
- **TFN** calculates the T function of Owen.
- **TIMESTAMP** prints the current YMDHMS date as a time stamp.
- **TRIANGLE_CDF** evaluates the Triangle CDF.
- **TRIANGLE_CDF_INV** inverts the Triangle CDF.
- **TRIANGLE_CHECK** checks the parameters of the Triangle CDF.
- **TRIANGLE_MEAN** returns the mean of the Triangle PDF.
- **TRIANGLE_PDF** evaluates the Triangle PDF.
- **TRIANGLE_SAMPLE** samples the Triangle PDF.
- **TRIANGLE_VARIANCE** returns the variance of the Triangle PDF.
- **TRIANGULAR_CDF** evaluates the Triangular CDF.
- **TRIANGULAR_CDF_INV** inverts the Triangular CDF.
- **TRIANGULAR_CHECK** checks the parameters of the Triangular CDF.
- **TRIANGULAR_MEAN** returns the mean of the Triangular PDF.
- **TRIANGULAR_PDF** evaluates the Triangular PDF.
- **TRIANGULAR_SAMPLE** samples the Triangular PDF.
- **TRIANGULAR_VARIANCE** returns the variance of the Triangular PDF.
- **TRIGAMMA** calculates the TriGamma function.
- **UNIFORM_01_CDF** evaluates the Uniform 01 CDF.
- **UNIFORM_01_CDF_INV** inverts the Uniform 01 CDF.
- **UNIFORM_01_MEAN** returns the mean of the Uniform 01 PDF.
- **UNIFORM_01_PDF** evaluates the Uniform 01 PDF.
- **UNIFORM_01_SAMPLE** is a random number generator.
- **UNIFORM_01_VARIANCE** returns the variance of the Uniform 01 PDF.
- **UNIFORM_01_ORDER_SAMPLE** samples the Uniform 01 Order PDF.
- **UNIFORM_CDF** evaluates the Uniform CDF.

- **UNIFORM_CDF_INV** inverts the Uniform CDF.
- **UNIFORM_CHECK** checks the parameters of the Uniform CDF.
- **UNIFORM_MEAN** returns the mean of the Uniform PDF.
- **UNIFORM_PDF** evaluates the Uniform PDF.
- **UNIFORM_SAMPLE** samples the Uniform PDF.
- **UNIFORM_VARIANCE** returns the variance of the Uniform PDF.
- **UNIFORM_DISCRETE_CDF** evaluates the Uniform Discrete CDF.
- **UNIFORM_DISCRETE_CDF_INV** inverts the Uniform Discrete CDF.
- **UNIFORM_DISCRETE_CHECK** checks the parameters of the Uniform discrete CDF.
- **UNIFORM_DISCRETE_MEAN** returns the mean of the Uniform discrete PDF.
- **UNIFORM_DISCRETE_PDF** evaluates the Uniform discrete PDF.
- **UNIFORM_DISCRETE_SAMPLE** samples the Uniform discrete PDF.
- **UNIFORM_DISCRETE_VARIANCE** returns the variance of the Uniform discrete PDF.
- **UNIFORM_NSPHERE_SAMPLE** samples the Uniform Unit Sphere PDF.
- **VON_MISES_CDF** evaluates the von Mises CDF.
- **VON_MISES_CDF_INV** inverts the von Mises CDF.
- **VON_MISES_CDF_VALUES** returns some values of the von Mises CDF.
- **VON_MISES_CHECK** checks the parameters of the von Mises PDF.
- **VON_MISES_CIRCULAR_VARIANCE** returns the circular variance of the von Mises PDF.
- **VON_MISES_MEAN** returns the mean of the von Mises PDF.
- **VON_MISES_PDF** evaluates the von Mises PDF.
- **VON_MISES_SAMPLE** samples the von Mises PDF.
- **WEIBULL_CDF** evaluates the Weibull CDF.
- **WEIBULL_CDF_INV** inverts the Weibull CDF.
- **WEIBULL_CDF_VALUES** returns some values of the Weibull CDF.
- **WEIBULL_CHECK** checks the parameters of the Weibull CDF.
- **WEIBULL_MEAN** returns the mean of the Weibull PDF.
- **WEIBULL_PDF** evaluates the Weibull PDF.
- **WEIBULL_SAMPLE** samples the Weibull PDF.
- **WEIBULL_VARIANCE** returns the variance of the Weibull PDF.
- **WEIBULL_DISCRETE_CDF** evaluates the Discrete Weibull CDF.
- **WEIBULL_DISCRETE_CDF_INV** inverts the Discrete Weibull CDF.
- **WEIBULL_DISCRETE_CHECK** checks the parameters of the discrete Weibull CDF.
- **WEIBULL_DISCRETE_PDF** evaluates the discrete Weibull PDF.

- **WEIBULL_DISCRETE_SAMPLE** samples the discrete Weibull PDF.
- **ZETA** estimates the Riemann Zeta function.
- **ZIPF_CDF** evaluates the Zipf CDF.
- **ZIPF_CHECK** checks the parameter of the Zipf PDF.
- **ZIPF_MEAN** returns the mean of the Zipf PDF.
- **ZIPF_PDF** evaluates the Zipf PDF.
- **ZIPF_SAMPLE** samples the Zipf PDF.
- **ZIPF_VARIANCE** returns the variance of the Zipf PDF.

You can go up one level to the C source codes.

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