

```
> restart;  
read("c:/appl/appl7.txt");
```

PROCEDURES:

*AllPermutations(n), AllCombinations(n, k), Benford(X), BootstrapRV(Data),
CDF:CHF:HF:IDF:PDF:SF(X, [x]), CoefOfVar(X), Convolution(X, Y),
ConvolutionIID(X, n), CriticalPoint(X, prob), Determinant(MATRIX), Difference(X, Y),
Display(X), ExpectedValue(X, [g]), KSTest(X, Data, Parameters), Kurtosis(X),
Maximum(X, Y), MaximumIID(X, n), Mean(X), MGF(X), Minimum(X, Y),
MinimumIID(X, n), Mixture(MixParameters, MixRVs),
MLE(X, Data, Parameters, [Rightcensor]), MLENHPP(X, Data, Parameters, obstime),
MLEWeibull(Data, [Rightcensor]), MOM(X, Data, Parameters),
NextCombination(Previous, size), NextPermutation(Previous), OrderStat(X, n, r, ["wo"]),
PlotDist(X, [low], [high]), PlotEmpCDF(Data, [low], [high]),
PlotEmpCIF(Data, [low], [high]), PlotEmpSF(Data, Censor),
PlotEmpVsFittedCDF(X, Data, Parameters, [low], [high]),
PlotEmpVsFittedCDF(X, Data, Parameters, [low], [high]),
PlotEmpVsFittedSF(X, Data, Parameters, Censor, low, high),
PPPlot(X, Data, Parameters), Product(X, Y), ProductIID(X, n),
QQPlot(X, Data, Parameters), RangeStat(X, n, ["wo"]), Skewness(X), Transform(X, g),
Truncate(X, low, high), Variance(X), VerifyPDF(X)*

Procedure Notation:

*X and Y are random variables
Greek letters are numeric or symbolic parameters
x is numeric or symbolic
n and r are positive integers, $n \geq r$
low and high are numeric
g is a function
Brackets [] denote optional parameters
"double quotes" denote character strings
MATRIX is a 2 x 2 array of random variables
A capitalized parameter indicates that it must be
entered as a list --> ex. Data := [1, 12.4, 34, 52.45, 63]*

Variate Generation:

*ArcTanVariate(alpha, phi), BinomialVariate(n, p, m), ExponentialVariate(lambda),
NormalVariate(mu, sigma), UniformVariate(), WeibullVariate(lambda, kappa, m)*

DATA SETS:

*BallBearing, HorseKickFatalities, Hurricane, MP6, RatControl, RatTreatment, USSHalfBeak
ArcSinRV(), ArcTanRV(alpha, phi), BetaRV(alpha, beta), CauchyRV(a, alpha), ChiRV(n),*

*ChiSquareRV(n), ErlangRV(lambda, n), ErrorRV(mu, alpha, d), ExponentialRV(lambda),
 ExponentialPowerRV(lambda, kappa), ExtremeValueRV(alpha, beta), FRV(n1, n2),
 GammaRV(lambda, kappa), GeneralizedParetoRV(gamma, delta, kappa),
 GompertzRV(delta, kappa), HyperbolicSecantRV(), HyperExponentialRV(p, l),
 HypoExponentialRV(l), IDBRV(gamma, delta, kappa), InverseGaussianRV(lambda, mu),
 InvertedGammaRV(alpha, beta), KSRV(n), LaPlaceRV(omega, theta),
 LogGammaRV(alpha, beta), LogisticRV(kappa, lambda), LogLogisticRV(lambda, kappa),
 LogNormalRV(mu, sigma), LomaxRV(kappa, lambda), MakehamRV(gamma, delta, kappa),
 MuthRV(kappa), NormalRV(mu, sigma), ParetoRV(lambda, kappa), RayleighRV(lambda),
 StandardCauchyRV(), StandardNormalRV(), StandardTriangularRV(m),
 StandardUniformRV(), TRV(n), TriangularRV(a, m, b), UniformRV(a, b),
 WeibullRV(lambda, kappa)*

Error, attempting to assign to `DataSets` which is protected.
 Try declaring `local DataSets`; see ?protect for details.

```

> bf := LogNormalRV(1, 2);
bfname := "LogNormalRV(1, 2)";

$$bf := \left[ \left[ x \rightarrow \frac{1}{4} \frac{\sqrt{2} e^{-\frac{1}{8} (\ln(x) - 1)^2}}{\sqrt{\pi} x} \right], [0, \infty], ["Continuous", "PDF"] \right]$$

bfname := "LogNormalRV(1, 2)" (1)
> #plot(1/csch(t)+1, t = 0..0.0010);
#plot(diff(1/csch(t), t), t=0..0.0010);
#limit(1/csch(t), t=0);
> solve(exp(-t) = y, t);
      -ln(y) (2)

```

```

> # discarded -ln(t + 1), t-> csch(t), t->arccsch(t), t -> tan(t),
> glist := [t -> t^2, t -> sqrt(t), t -> 1/t, t -> arctan(t), t
-> exp(t), t -> ln(t), t -> exp(-t), t -> -ln(t), t -> ln(t+1),
t -> 1/(ln(t+2)), t -> tanh(t), t -> sinh(t), t -> arcsinh(t),
t-> csch(t+1), t->arccsch(t+1), t-> 1/tanh(t+1), t-> 1/sinh(t+1),
t-> 1/arcsinh(t+1), t-> 1/csch(t)+1, t-> tanh(1/t), t->csch
(1/t), t-> arccsch(1/t), t-> arctanh(1/t) ]:
base := t -> PDF(bf, t):
print(base(x)):

for i from 22 to 22(glist) do
    print( "i is", i, " -----"
-----" );
    g := glist[i]:
    l := bf[2][1];
    u := bf[2][2];
    Temp := Transform(bf, [[unapply(g(x), x)], [l, u]]);

```

```

#print( "l and u", l, u );
#print("g(x)", g(x), "base", base(x),bfname);
print("f(x)", PDF(Temp, x));
#print("F(x)", CDF(Temp, x));
#print("IDF(x)", IDF(Temp));
#print("S(x)", SF(Temp, x));
print("h(x)", HF(Temp, x));
#print("mean and variance", Mean(Temp), Variance(Temp));
#assume(r > 0); mf := int(x^r*PDF(Temp, x), x = Temp[2][1] ..
Temp[2][2]);
#print("MF", mf);
#print("MGF", MGF(Temp));
PlotDist(PDF(Temp), bf[2][1], bf[2][2]);
PlotDist(HF(Temp), bf[2][1], bf[2][2]);
latex(PDF(Temp,x));
#print("transforming with", [[x->g(x)],[0,infinity]]);
#X2 := Transform(bf, [[x->g(x)],[0,infinity]]);
#print("pdf of X2 = ", PDF(X2,x));
#print("pdf of Temp = ", PDF(Temp,x));
od;

```

$$\frac{1}{4} \frac{\sqrt{2} e^{-\frac{1}{8} (\ln(x) - 1)^2}}{\sqrt{\pi} x}$$

"i is", 22,

"-----"

$$g := t \rightarrow \operatorname{arccsch}\left(\frac{1}{t}\right)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y \rightarrow \frac{1}{4} \frac{\sqrt{2} e^{-\frac{1}{8} (\ln(\sinh(y)) - 1)^2}}{\sqrt{\pi} \sinh(y)} \cosh(y), [0, \infty], ["Continuous", "PDF"] \right]$$

$$\text{"f(x)", } \frac{1}{4} \frac{\sqrt{2} e^{-\frac{1}{8} (\ln(\sinh(x)) - 1)^2}}{\sqrt{\pi} \sinh(x)} \cosh(x)$$

$$\text{"h(x)", } -\frac{1}{2} \frac{\sqrt{2} e^{-\frac{1}{8} (\ln(\sinh(x)) - 1)^2}}{\sqrt{\pi} \sinh(x) \left(-1 + \operatorname{erf}\left(\frac{1}{4} \sqrt{2} (\ln(e^x - 1) + \ln(e^x + 1) - \ln(2) - x - 1)\right) \right)}$$



