```
> 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 >= 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)";
```

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

$$bfname := \text{"LogNormalRV(1, 2)"} \qquad \textbf{(1)}$$

```
> #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);
```

$$-\ln(y) \qquad \textbf{(2)}$$

```
> # 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 18 to nops(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", 18,

" ----------"

$$g := t \to \frac{1}{\operatorname{arcsinh}(t+1)}$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{1}{4}\,\frac{\sqrt{2}\,e^{-\frac{1}{8}\left(\ln\left(-1+\sinh\left(\frac{1}{y\sim}\right)\right)-1\right)^2}\cosh\left(\frac{1}{y\sim}\right)}{\sqrt{\pi}\left(-1+\sinh\left(\frac{1}{y\sim}\right)\right)y\sim^2}\right],\left[0,\ \frac{1}{\ln\left(1+\sqrt{2}\right)}\right],\right.$$

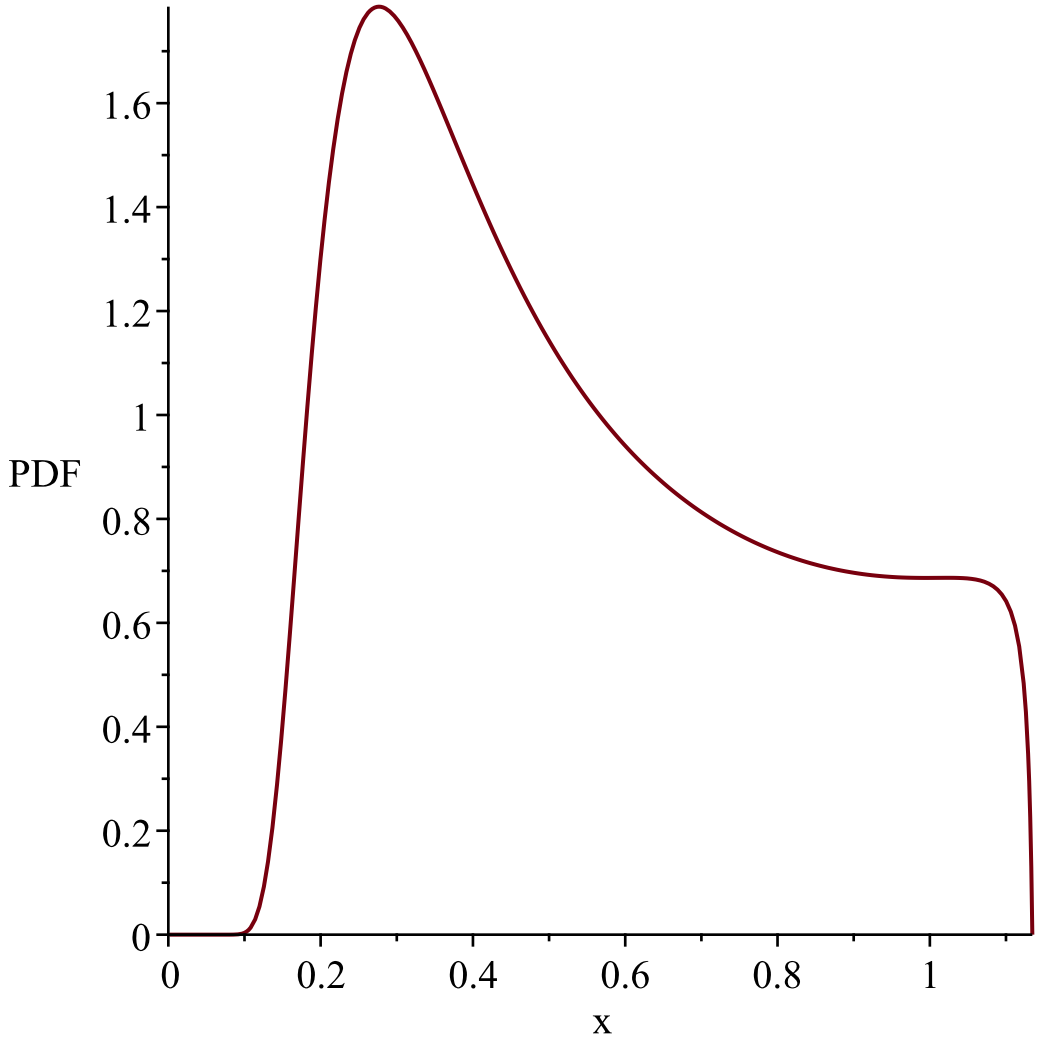
$$\left.[\text{"Continuous"}, \text{"PDF"}]\right]$$

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

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

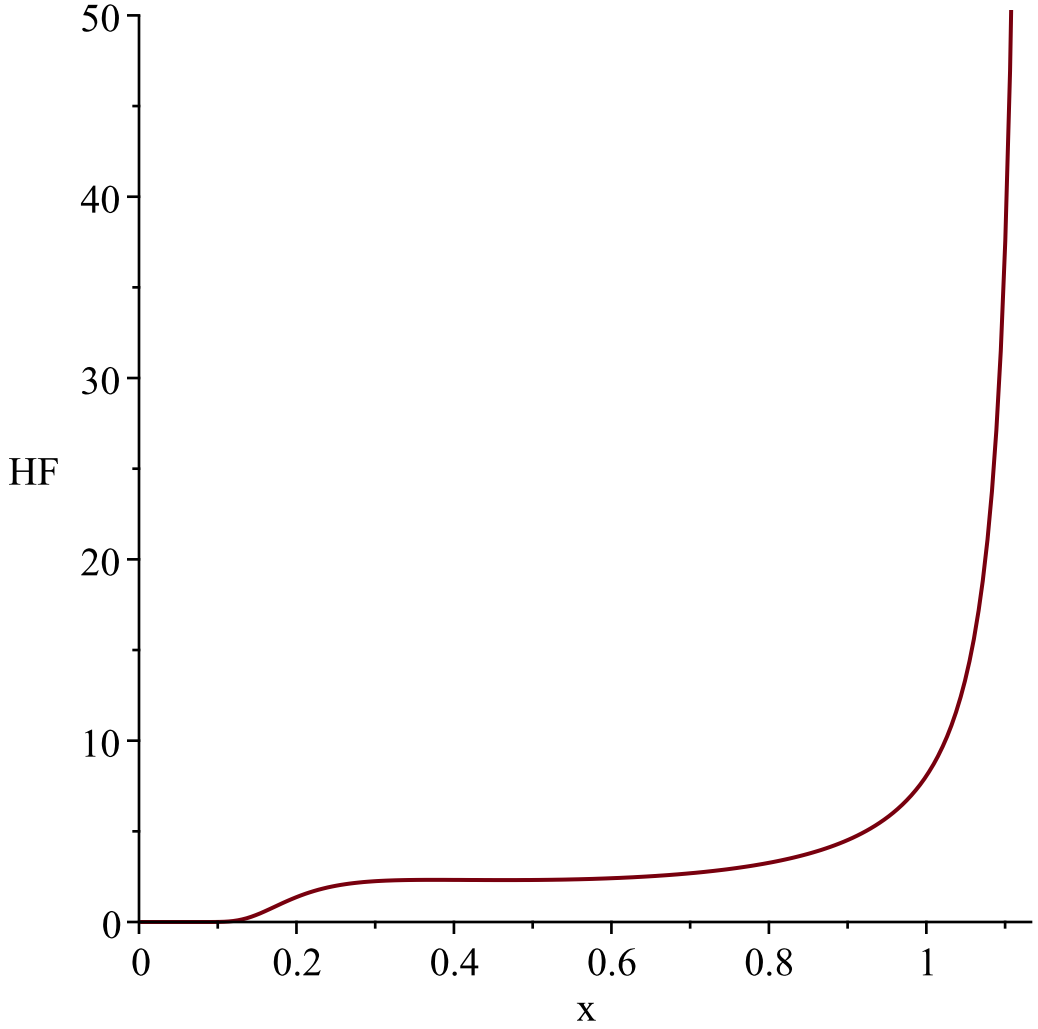
*WARNING(PlotDist): High value provided by user, ∞ is greater than maximum support value of the random variable,* $\frac{1}{\ln(1+\sqrt{2})}$

*Resetting high to RV's maximum support value*




*WARNING(PlotDist): High value provided by user, ∞ is greater than maximum support value of the random variable,* $\frac{1}{\ln(1+\sqrt{2})}$

*Resetting high to RV's maximum support value*




```
1/4\,{\frac {\sqrt {2}{{\rm e}^{-1/8\, \left( \ln  \left( -1+
\sinh
 \left( {x}^{-1} \right)  \right) -1 \right) ^{2}}}\cosh \left(
{x}^{-
1} \right) }{\sqrt {\pi} \left( -1+\sinh \left( {x}^{-1} \right)

 \right) {x}^{2}}}
```

"i is", 19,

" ----------"

$$g := t \to \frac{1}{\operatorname{csch}(t)} + 1$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[ y\sim \to \frac{1}{4} \, \frac{\sqrt{2}\, e^{-\frac{1}{8}\left(\ln\left(\operatorname{arccsch}\left(\frac{1}{y\sim - 1}\right)\right) - 1\right)^2}}{\sqrt{\pi}\, \sqrt{y\sim^2 - 2\, y\sim + 2}\, \operatorname{arccsch}\left(\frac{1}{y\sim - 1}\right)} \right], [1, \infty], ["Continuous",\right.$$

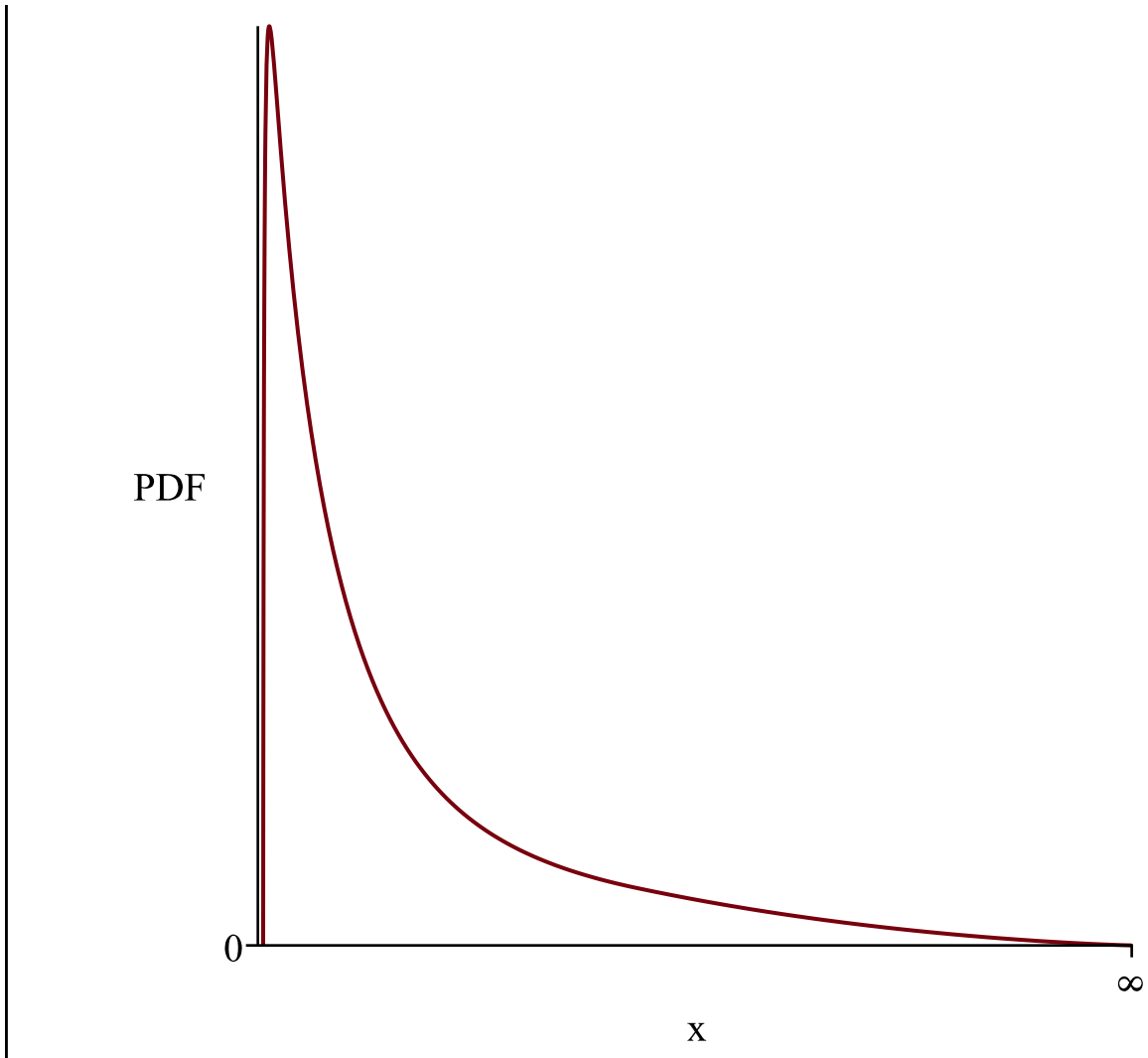
"PDF"]

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

"h(x)",

$$-\left(\sqrt{2}\ e^{-\frac{1}{8}\left(\ln\left(\operatorname{arccsch}\left(\frac{1}{x-1}\right)\right)-1\right)^2}\right) \Bigg/ \left(\sqrt{x^2-2x+2}\ \operatorname{arccsch}\left(\frac{1}{x-1}\right)\left(\sqrt{2}\left(\int_1^x \frac{e^{-\frac{1}{8}\left(\ln\left(\operatorname{arccsch}\left(\frac{1}{t-1}\right)\right)-1\right)^2}}{\sqrt{t^2-2t+2}\ \operatorname{arccsch}\left(\frac{1}{t-1}\right)}\,dt\right)-4\sqrt{\pi}\right)\right)$$

*WARNING(PlotDist): Low value provided by user*, 0
*is less than minimum support value of random variable*
1
*Resetting low to RV's minimum support value*




*WARNING(PlotDist): Low value provided by user*, 0
*is less than minimum support value of random variable*
1
*Resetting low to RV's minimum support value*

Warning,  computation interrupted