```
> 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 := MakehamRV(1,2,2);
  bfname := "MakehamRV(1,2,2)";
```

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

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

```
> #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 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;
```

$$\left(1+2\,2^{x}\right)\,\mathrm{e}^{-x-\frac{2\left(2^{x}-1\right)}{\ln(2)}}$$

"i is", 22,

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

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

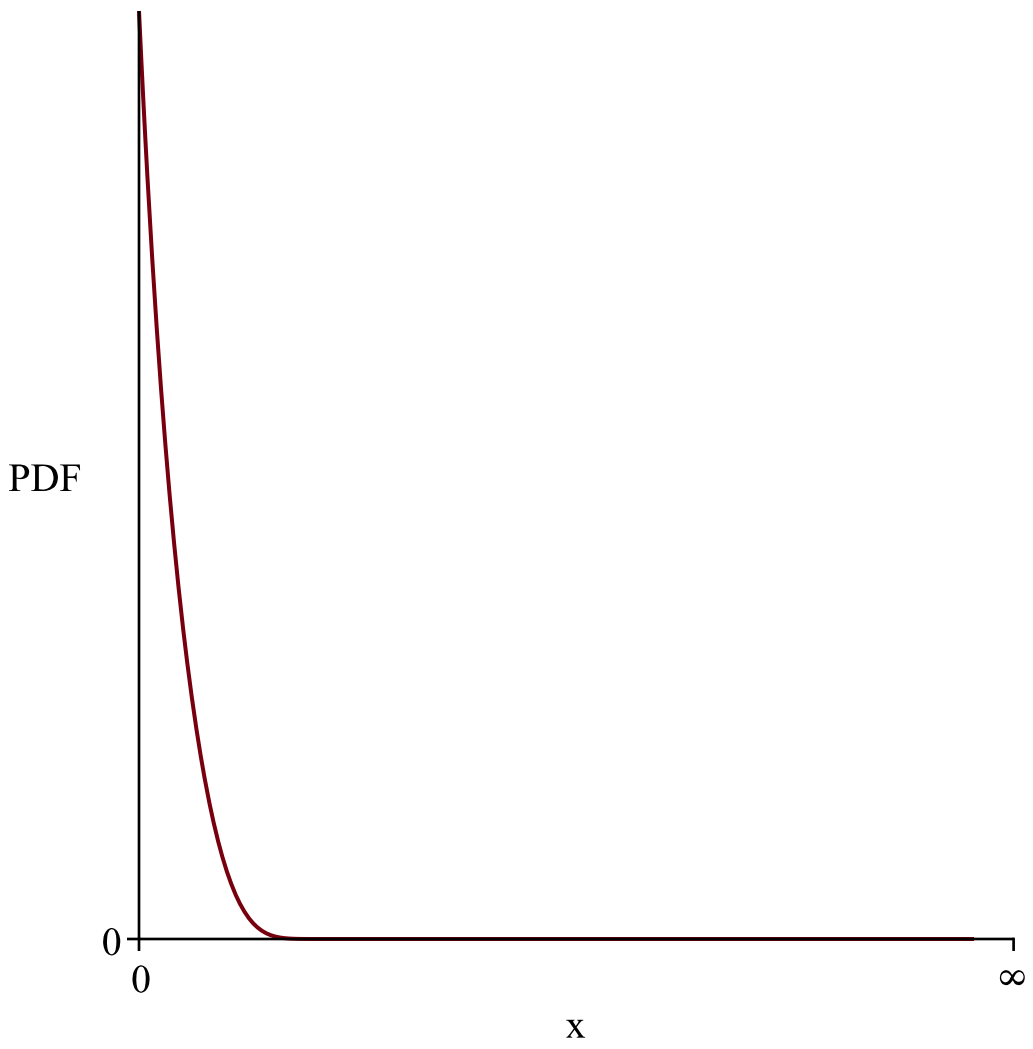
$$l := 0$$

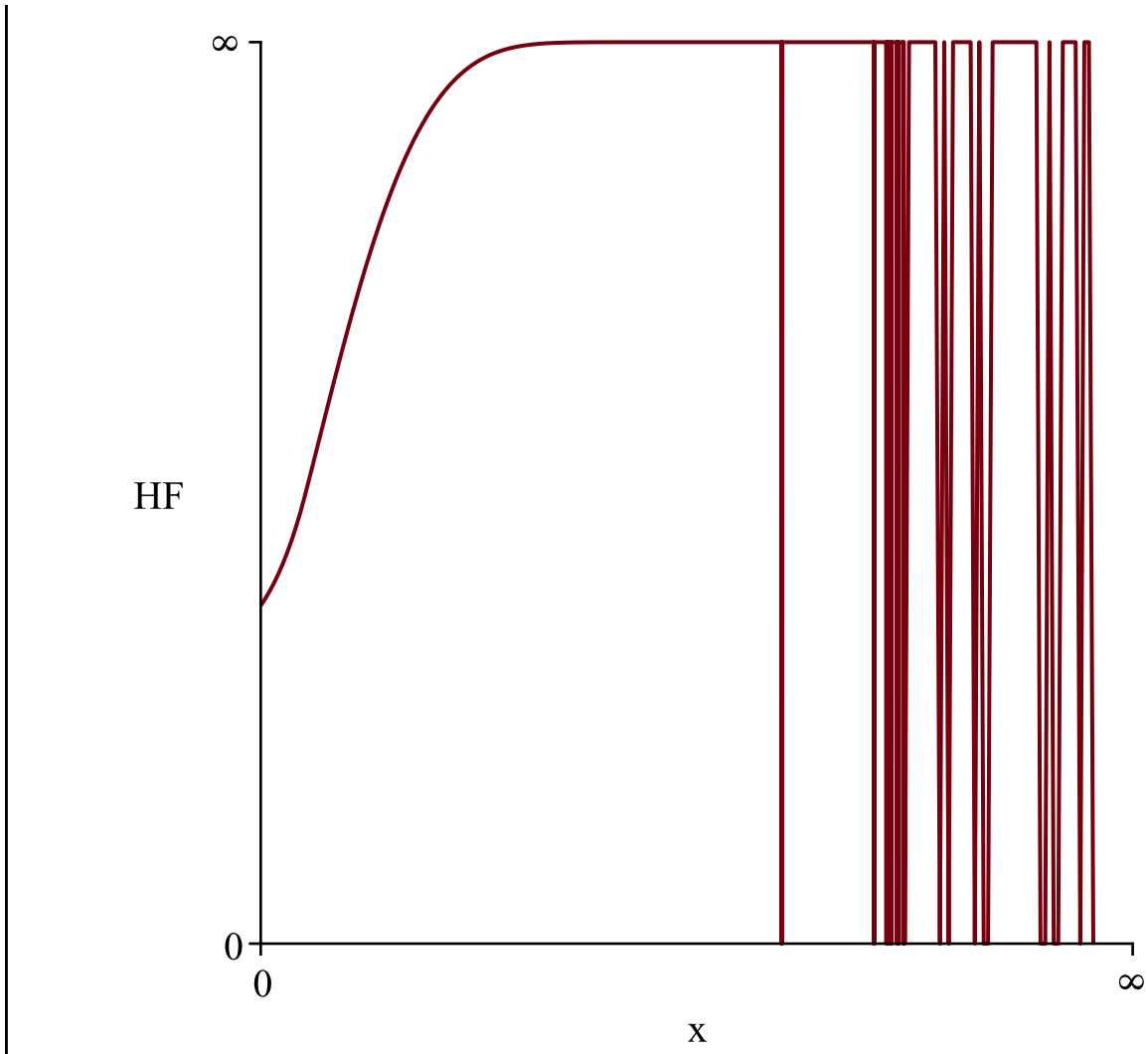
$$u := \infty$$

$$Temp := \left[\left[y\sim \to \left(1+2^{1+\sinh(y\sim)}\right)\,\mathrm{e}^{-\frac{2^{1+\sinh(y\sim)}+\ln(2)\,\sinh(y\sim)-2}{\ln(2)}}\,\cosh(y\sim)\right],\,[0,\,\infty],\,\left["\text{Continuous}","\text{PDF}"\right]\right]$$

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

$$\text{"h(x)"},\,\cosh(x)\,\mathrm{e}^{\frac{1}{2}\,\frac{-2\ln(2)\,\sinh(x)-\mathrm{e}^{-x}\ln(2)+\mathrm{e}^{x}\ln(2)+2\,2^{1-\frac{1}{2}\,\mathrm{e}^{-x}+\frac{1}{2}\,\mathrm{e}^{x}}-2\,2^{1+\sinh(x)}}{\ln(2)}}\,\left(1+2^{1+\sinh(x)}\right)$$


PDF
0
0
∞
x




```
 \left( 1+{2}^{1+\sinh \left( x \right) } \right) {{\rm e}^{-
{\frac {{
2}^{1+\sinh \left( x \right) }+\ln  \left( 2 \right) \sinh \left
( x
 \right) -2}{\ln  \left( 2 \right) }}}}\cosh \left( x \right)
```