```
> 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 := ArcSinRV();
  bfname := "ArcSinRV()";
```

$$bf := \left[\left[x \to \frac{1}{\pi\sqrt{x\,(1-x)}}\right], [0, 1], [\text{"Continuous"}, \text{"PDF"}]\right]$$

$$bfname := \text{"ArcSinRV()"} \qquad \textbf{(1)}$$

```
> #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 nops(glist) do
     print( "i is", i, "  ----------------------------------------
  ------------------------------------------------------------------
  -------------");
    g := glist[i]:
     l := 0;
     u := infinity;
     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("S(x)", SF(Temp, x));
    print("h(x)", HF(Temp, x));
    print("mean and variance", Mean(Temp), Variance(Temp));
    PlotDist(PDF(Temp), 0, 40);
    PlotDist(HF(Temp), 0, 40);
    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;
```

$$\frac{1}{\pi\sqrt{x\,(1-x)}}$$

"i is", 22,
" --
----------"

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \rightarrow \frac{\cosh(y\sim)}{\pi\sqrt{-(-1+\sinh(y\sim))\sinh(y\sim)}}\right], \left[0, \ln\left(1+\sqrt{2}\right)\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$

$$\text{"l and u"}, 0, \infty$$

$$\text{"g(x)"}, \operatorname{arccsch}\left(\frac{1}{x}\right), \text{"base"}, \frac{1}{\pi\sqrt{x\,(1-x)}}, \text{"ArcSinRV()"}$$

$$\text{"f(x)"}, \frac{\cosh(x)}{\pi\sqrt{-(-1+\sinh(x))\sinh(x)}}$$

$$\text{"S(x)"}, -\frac{1}{2}\,\frac{-\pi+2\arcsin\left(e^{x}-1-e^{-x}\right)}{\pi}$$

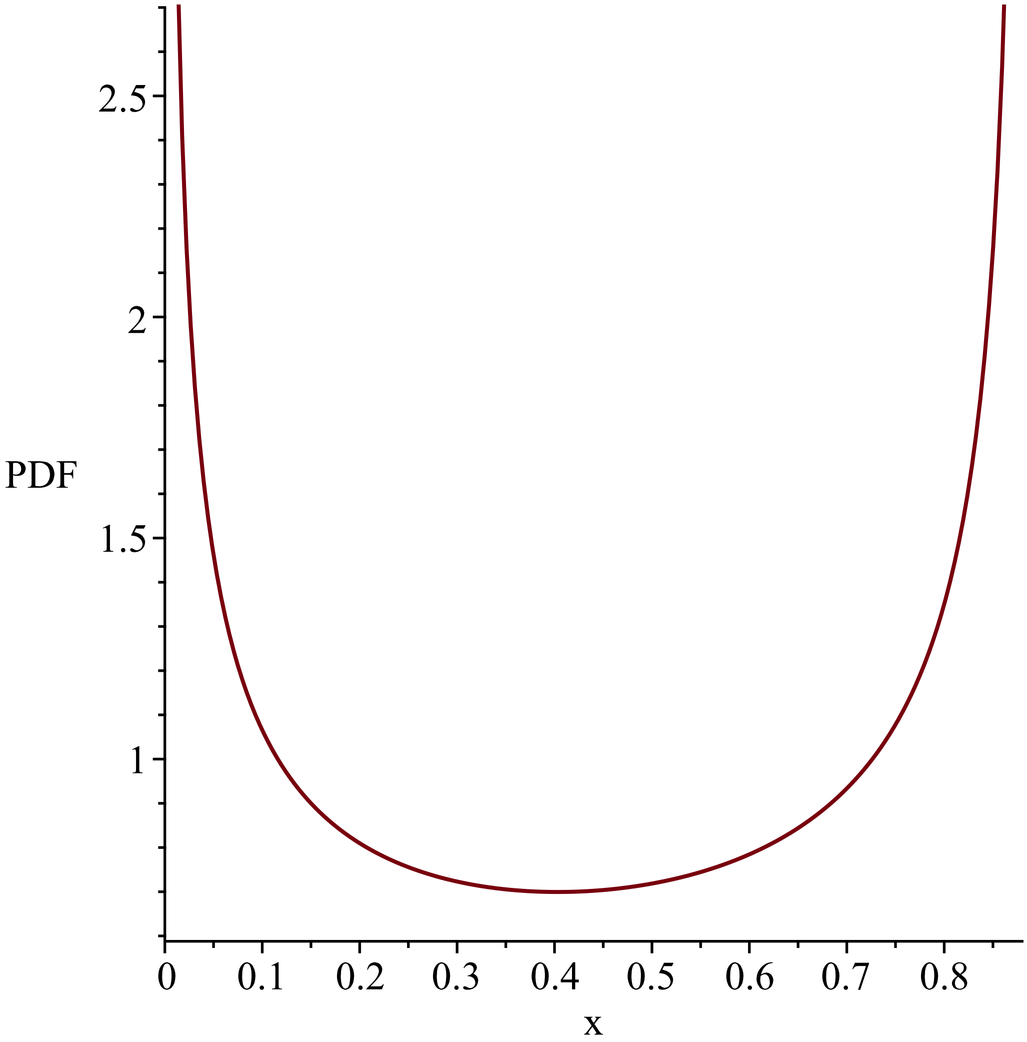
$$\text{"h(x)"}, -\frac{2\cosh(x)}{\sqrt{-(-1+\sinh(x))\sinh(x)}\,\left(-\pi+2\arcsin\left(e^{x}-1-e^{-x}\right)\right)}$$

$$\text{"mean and variance"}, \frac{\displaystyle\int_{0}^{\ln\left(1+\sqrt{2}\right)} \frac{x\cosh(x)}{\sqrt{\sinh(x)}\,\sqrt{1-\sinh(x)}}\,dx}{\pi},$$

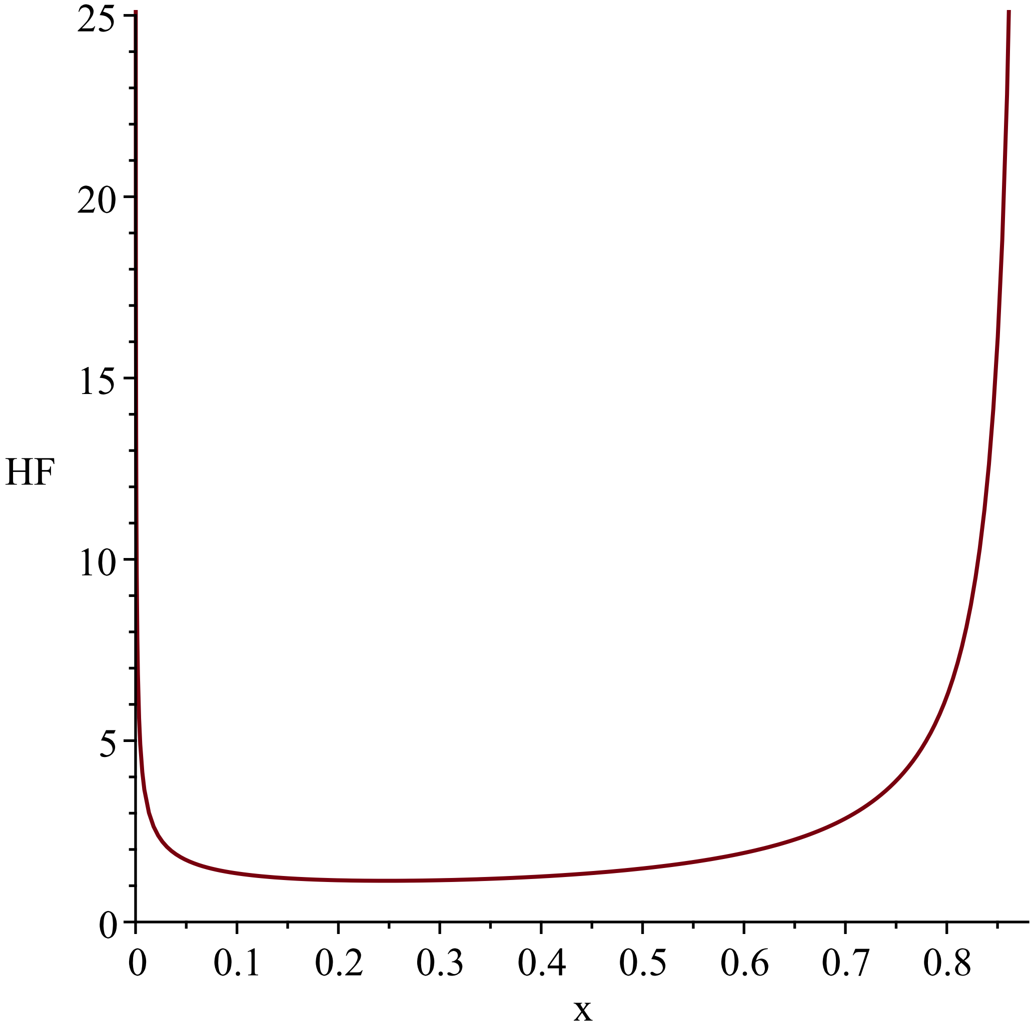
$$\frac{1}{\pi^{2}}\left(\left(\int_{0}^{\ln\left(1+\sqrt{2}\right)} \frac{x^{2}\cosh(x)}{\sqrt{\sinh(x)}\,\sqrt{1-\sinh(x)}}\,dx\right)\pi\right.$$

$$-\left(\left(\int_{0}^{\ln\left(1+\sqrt{2}\right)} \frac{x\cosh(x)}{\sqrt{\sinh(x)}\,\sqrt{1-\sinh(x)}}\,\mathrm{d}x\right)^{2}\right)$$

WARNING(PlotDist): High value provided by user, 40 *is greater than maximum support value of the random variable,* $\ln\left(1+\sqrt{2}\right)$ *Resetting high to RV's maximum support value*



WARNING(PlotDist): High value provided by user, 40 *is greater than maximum support value of the random variable,* $\ln\left(1+\sqrt{2}\right)$ *Resetting high to RV's maximum support value*



```
{\frac {\cosh \left( x \right) }{\pi\,\sqrt {- \left( -1+\sinh
\left(
x \right)  \right) \sinh \left( x \right) }}}
```

"i is", 23,

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

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

$$l := 0$$

$$u := \infty$$

```
Error, (in Transform) sort: comparison function argument, proc
(x, y) options operator, arrow; evalb(evalf(x) < evalf(y)) end
proc, must be a function that always returns true or false
```

>