```
> 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 := ChiSquaredRV(a);
  bfname := "ChiSquaredRV(a)";
Originally a, renamed a~:
  is assumed to be: AndProp(integer,RealRange(1,infinity))
```

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

$$bfname := "\text{ChiRV(a)}" \quad \textbf{(1)}$$

```
> #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);
```

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

```
> # discarded  -ln(t + 1),  t-> csch(t),t->arccsch(t),t -> tan(t),
> #name of the file for latex output
  filename := "C:/LatexOutput/ChiSquaredGen.tex";


  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)):
```

```
#begin latex file formatting
appendto(filename);
  printf("\\documentclass[12pt]{article} \n");
  printf("\\usepackage{amsfonts} \n");
  printf("\\begin{document} \n");
  print(bfname);
  printf("$$");
  latex(bf[1]);
  printf("$$");
writeto(terminal);

#begin loopint through transformations
for i from 1 to 22 do
#for i from 1 to 3 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]]);

  #terminal output
  print( "l and u", l, u );
  print("g(x)", g(x), "base", base(x),bfname);
  print("f(x)", PDF(Temp, x));



  #latex output
  appendto(filename);
  printf("----------------------------------------------------------
-----------------------------------  \\\\");
  printf("$$");
  latex(glist[i]);
  printf("$$");
  printf("Probability Distribution Function \n$$  f(x)=");
  latex(PDF(Temp,x));
  printf("$$");



  writeto(terminal);


od;

#final latex output
appendto(filename);
printf("\\end{document}\n");
writeto(terminal);
```

filename := "C:/LatexOutput/ChiGen.tex"

$$\frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$$

"i is", 1,

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

$$g := t\to t^2$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

"g(x)", x^2, "base", $\frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

"f(x)", $\frac{2^{-\frac{1}{2}a\sim}\,x^{\frac{1}{2}a\sim-1}\,e^{-\frac{1}{2}x}}{\Gamma\left(\frac{1}{2}a\sim\right)}$

"i is", 2,

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

$$g := t\to\sqrt{t}$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim\to\frac{4\,2^{-\frac{1}{2}a\sim}\,y\sim^{2a\sim-1}\,e^{-\frac{1}{2}y\sim^4}}{\Gamma\left(\frac{1}{2}a\sim\right)}\right],\,[0,\,\infty],\,["\text{Continuous}",\,"\text{PDF}"]\right]$$

"l and u", 0, ∞

"g(x)", $\sqrt{x}$, "base", $\frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

"f(x)", $\frac{4\,2^{-\frac{1}{2}a\sim}\,x^{2a\sim-1}\,e^{-\frac{1}{2}x^4}}{\Gamma\left(\frac{1}{2}a\sim\right)}$

"i is", 3,

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

$$g := t \to \frac{1}{t}$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$"g(x)", \frac{1}{x}, "base", \frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}, "ChiRV(a)"$$

$$"f(x)", \frac{x^{-a\sim-1}\, e^{-\frac{1}{2x^2}}\, 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)}$$

"i is", 4,

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

$$g := t \to \arctan(t)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\tan(y\sim)^{a\sim-1}\, e^{-\frac{1}{2}\tan(y\sim)^2}\, 2^{-\frac{1}{2}a\sim+1}\left(1+\tan(y\sim)^2\right)}{\Gamma\left(\frac{1}{2}a\sim\right)}\right], \left[0, \frac{1}{2}\pi\right], ["Continuous", "PDF"]\right]$$

"l and u", 0, ∞

$$"g(x)", \arctan(x), "base", \frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}, "ChiRV(a)"$$

$$\text{"f(x)"},\ \frac{\tan(x)^{a\sim-1}\,e^{-\frac{1}{2}\tan(x)^2}\,2^{-\frac{1}{2}a\sim+1}\left(1+\tan(x)^2\right)}{\Gamma\left(\frac{1}{2}\,a\sim\right)}$$

"i is", 5,

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

$$g := t\to e^t$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$\text{"g(x)"},\ e^x,\ \text{"base"},\ \frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}\,a\sim\right)},\ \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ \frac{\ln(x)^{a\sim-1}\,e^{-\frac{1}{2}\ln(x)^2}\,2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}\,a\sim\right)x}$$

"i is", 6,

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

$$g := t\to\ln(t)$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$\text{"g(x)"},\ \ln(x),\ \text{"base"},\ \frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}\,a\sim\right)},\ \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ \frac{e^{x\,a\sim-\frac{1}{2}e^{2x}}\,2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}\,a\sim\right)}$$

"i is", 7,

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

$$g := t \to e^{-t}$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

"g(x)", e^{-x}, "base", $\frac{x^{a\sim-1} e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

"f(x)", $-\frac{2^{-\frac{1}{2}a\sim+1} e^{-\frac{1}{2}\ln(x)^2} \left(-\frac{1}{\ln(x)}\right)^{-a\sim}}{\ln(x)\,\Gamma\left(\frac{1}{2}a\sim\right) x}$

"i is", 8,

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

$$g := t \to -\ln(t)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{e^{-y\sim a\sim-\frac{1}{2}} e^{-2y\sim} 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)} \right], [-\infty, \infty], ["Continuous", "PDF"] \right]$$

"l and u", 0, ∞

"g(x)", $-\ln(x)$, "base", $\frac{x^{a\sim-1} e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

"f(x)", $\frac{e^{-xa\sim-\frac{1}{2}} e^{-2x} 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)}$

"i is", 9,

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

$$g := t \to \ln(t+1)$$

$$l := 0$$

$$u := \infty$$

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

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

$$\text{"g(x)"}, \ln(x+1), \text{"base"}, \frac{x^{a\sim-1}e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\Gamma\left(\frac{1}{2}a\sim\right)}, \text{"ChiRV(a)"}$$

$$\text{"f(x)"}, \frac{2^{-\frac{1}{2}a\sim+1}\left(e^{x}-1\right)^{a\sim-1}e^{-\frac{1}{2}e^{2x}+e^{x}-\frac{1}{2}+x}}{\Gamma\left(\frac{1}{2}a\sim\right)}$$

"i is", 10,
" ----------"

$$g := t \to \frac{1}{\ln(t+2)}$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\left(e^{\frac{1}{y\sim}}-2\right)^{a\sim-1}2^{-\frac{1}{2}a\sim+1}e^{-\frac{1}{2}\frac{e^{\frac{2}{y\sim}}y\sim-4e^{\frac{1}{y\sim}}y\sim+4y\sim-2}{y\sim}}}{\Gamma\left(\frac{1}{2}a\sim\right)y\sim^2}\right], \left[0, \frac{1}{\ln(2)}\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$

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

$$\text{"g(x)"}, \frac{1}{\ln(x+2)}, \text{"base"}, \frac{x^{a\sim-1}e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\Gamma\left(\frac{1}{2}a\sim\right)}, \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ \frac{\left(e^{\frac{1}{x}}-2\right)^{a\sim-1}\ 2^{-\frac{1}{2}a\sim+1}\ e^{-\frac{1}{2}\frac{e^{\frac{2}{x}}x-4e^{\frac{1}{x}}x+4x-2}{x}}}{\Gamma\left(\frac{1}{2}a\sim\right)x^2}$$

"i is", 11,

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

$$g := t\to\tanh(t)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim\to-\frac{\operatorname{arctanh}(y\sim)^{a\sim-1}\ e^{-\frac{1}{2}\operatorname{arctanh}(y\sim)^2}\ 2^{-\frac{1}{2}a\sim+1}}{\left(y\sim^2-1\right)\Gamma\left(\frac{1}{2}a\sim\right)}\right],[0,1],[\text{"Continuous"},\ \text{"PDF"}]\right]$$

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

$$\text{"g(x)"},\ \tanh(x),\ \text{"base"},\ \frac{x^{a\sim-1}\ e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\ \Gamma\left(\frac{1}{2}a\sim\right)},\ \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ -\frac{\operatorname{arctanh}(x)^{a\sim-1}\ e^{-\frac{1}{2}\operatorname{arctanh}(x)^2}\ 2^{-\frac{1}{2}a\sim+1}}{\left(x^2-1\right)\Gamma\left(\frac{1}{2}a\sim\right)}$$

"i is", 12,

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

$$g := t\to\sinh(t)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim\to\frac{\operatorname{arcsinh}(y\sim)^{a\sim-1}\ e^{-\frac{1}{2}\operatorname{arcsinh}(y\sim)^2}\ 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)\sqrt{y\sim^2+1}}\right],[0,\infty],[\text{"Continuous"},\ \text{"PDF"}]\right]$$

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

$$\text{"g(x)"},\ \sinh(x),\ \text{"base"},\ \frac{x^{a\sim-1}\ e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\ \Gamma\left(\frac{1}{2}a\sim\right)},\ \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ \frac{\operatorname{arcsinh}(x)^{a\sim-1}\,e^{-\frac{1}{2}\operatorname{arcsinh}(x)^2}\,2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)\sqrt{x^2+1}}$$

"i is", 13,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$\text{"g(x)"}, \operatorname{arcsinh}(x), \text{"base"}, \frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}, \text{"ChiRV(a)"}$$

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

"i is", 14,

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

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{(-1+\operatorname{arccsch}(y\sim))^{a\sim-1}\,e^{-\frac{1}{2}(-1+\operatorname{arccsch}(y\sim))^2}\,2^{-\frac{1}{2}a\sim+1}}{\sqrt{y\sim^2+1}\,\Gamma\left(\frac{1}{2}a\sim\right)|y\sim|}\right], \left[0,\ \frac{2}{e-e^{-1}}\right], [\text{"Continuous"},\ \text{"PDF"}]\right]$$

"l and u", 0, ∞

$$\text{"g(x)"},\ \operatorname{csch}(x+1),\ \text{"base"},\ \frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)},\ \text{"ChiRV(a)"}$$

$$\text{"f(x)"},\ \frac{(-1+\operatorname{arccsch}(x))^{a\sim-1}\,e^{-\frac{1}{2}(-1+\operatorname{arccsch}(x))^2}\,2^{-\frac{1}{2}a\sim+1}}{\sqrt{x^2+1}\,\Gamma\left(\frac{1}{2}a\sim\right)\,|x|}$$

"i is", 15,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$\text{"g(x)"},\ \operatorname{arccsch}(x+1),\ \text{"base"},\ \frac{x^{a\sim-1}\,e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)},\ \text{"ChiRV(a)"}$$

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

"i is", 16,

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

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\left(-1+\operatorname{arctanh}\left(\frac{1}{y\sim}\right)\right)^{a\sim-1}\, e^{-\frac{1}{2}\left(-1+\operatorname{arctanh}\left(\frac{1}{y\sim}\right)\right)^2}\, 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)\left(y\sim^2-1\right)}\right], \left[1, \frac{e+e^{-1}}{e-e^{-1}}\right], \left["\text{Continuous}", "\text{PDF}"\right]\right]$$

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

$$"\text{g(x)}", \frac{1}{\tanh(x+1)}, "\text{base}", \frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}, "\text{ChiRV(a)}"$$

$$"\text{f(x)}", \frac{\left(-1+\operatorname{arctanh}\left(\frac{1}{x}\right)\right)^{a\sim-1}\, e^{-\frac{1}{2}\left(-1+\operatorname{arctanh}\left(\frac{1}{x}\right)\right)^2}\, 2^{-\frac{1}{2}a\sim+1}}{\Gamma\left(\frac{1}{2}a\sim\right)\left(x^2-1\right)}$$

"i is", 17,

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

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\left(-1+\operatorname{arcsinh}\left(\frac{1}{y\sim}\right)\right)^{a\sim-1}\, e^{-\frac{1}{2}\left(-1+\operatorname{arcsinh}\left(\frac{1}{y\sim}\right)\right)^2}\, 2^{-\frac{1}{2}a\sim+1}}{\sqrt{y\sim^2+1}\;\Gamma\left(\frac{1}{2}a\sim\right)\left|y\sim\right|}\right], \left[0, \frac{2}{e-e^{-1}}\right], \left["\text{Continuous}", "\text{PDF}"\right]\right]$$

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

$$"\text{g(x)}", \frac{1}{\sinh(x+1)}, "\text{base}", \frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}, "\text{ChiRV(a)}"$$

$$\text{"f(x)"},\ \frac{\left(-1+\operatorname{arcsinh}\left(\frac{1}{x}\right)\right)^{a\sim-1}\ e^{-\frac{1}{2}\left(-1+\operatorname{arcsinh}\left(\frac{1}{x}\right)\right)^2}\ 2^{-\frac{1}{2}a\sim+1}}{\sqrt{x^2+1}\ \Gamma\left(\frac{1}{2}\ a\sim\right)\ |x|}$$

"i is", 18,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

$$\text{"g(x)"},\ \frac{1}{\operatorname{arcsinh}(x+1)},\ \text{"base"},\ \frac{x^{a\sim-1}\ e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\ \Gamma\left(\frac{1}{2}\ a\sim\right)},\ \text{"ChiRV(a)"}$$

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

"i is", 19,

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

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\operatorname{arccsch}\left(\frac{1}{y\sim-1}\right)^{a\sim-1}\ e^{-\frac{1}{2}\operatorname{arccsch}\left(\frac{1}{y\sim-1}\right)^2}\ 2^{-\frac{1}{2}a\sim+1}}{\sqrt{y\sim^2-2\,y\sim+2}\ \Gamma\left(\frac{1}{2}\ a\sim\right)}\right], [1,\ \infty],\right.$$

["Continuous", "PDF"]

"l and u", 0, ∞

"g(x)", $\frac{1}{\operatorname{csch}(x)} + 1$, "base", $\frac{x^{a\sim - 1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim - 1}\,\Gamma\left(\frac{1}{2}\,a\sim\right)}$, "ChiRV(a)"

"f(x)", $\frac{\operatorname{arccsch}\left(\frac{1}{x-1}\right)^{a\sim - 1}\, e^{-\frac{1}{2}\operatorname{arccsch}\left(\frac{1}{x-1}\right)^2}\, 2^{-\frac{1}{2}a\sim + 1}}{\sqrt{x^2 - 2x + 2}\;\Gamma\left(\frac{1}{2}\,a\sim\right)}$

"i is", 20,

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

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

$l := 0$

$u := \infty$

$Temp := \left[\left[y\sim \to -\frac{\operatorname{arctanh}(y\sim)^{-a\sim - 1}\, e^{-\frac{1}{2\operatorname{arctanh}(y\sim)^2}}\, 2^{-\frac{1}{2}a\sim + 1}}{\left(y\sim^2 - 1\right)\Gamma\left(\frac{1}{2}\,a\sim\right)}\right], [0, 1], \text{["Continuous", "PDF"]}\right]$

"l and u", 0, ∞

"g(x)", $\tanh\left(\frac{1}{x}\right)$, "base", $\frac{x^{a\sim - 1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim - 1}\,\Gamma\left(\frac{1}{2}\,a\sim\right)}$, "ChiRV(a)"

"f(x)", $-\frac{\operatorname{arctanh}(x)^{-a\sim - 1}\, e^{-\frac{1}{2\operatorname{arctanh}(x)^2}}\, 2^{-\frac{1}{2}a\sim + 1}}{\left(x^2 - 1\right)\Gamma\left(\frac{1}{2}\,a\sim\right)}$

"i is", 21,

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

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \to \frac{\operatorname{arccsch}(y\sim)^{-a\sim-1}\, e^{-\frac{1}{2\operatorname{arccsch}(y\sim)^2}}\, 2^{-\frac{1}{2}a\sim+1}}{\sqrt{y\sim^2+1}\ \Gamma\left(\frac{1}{2}a\sim\right)|y\sim|}\right], [0,\ \infty], [\text{"Continuous"}, \text{"PDF"}]\right]$$

"l and u", 0, ∞

"g(x)", $\operatorname{csch}\left(\frac{1}{x}\right)$, "base", $\frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

"f(x)", $\frac{\operatorname{arccsch}(x)^{-a\sim-1}\, e^{-\frac{1}{2\operatorname{arccsch}(x)^2}}\, 2^{-\frac{1}{2}a\sim+1}}{\sqrt{x^2+1}\ \Gamma\left(\frac{1}{2}a\sim\right)|x|}$

"i is", 22,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, ∞

"g(x)", $\operatorname{arccsch}\left(\frac{1}{x}\right)$, "base", $\frac{x^{a\sim-1}\, e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1}\,\Gamma\left(\frac{1}{2}a\sim\right)}$, "ChiRV(a)"

$$\text{"f(x)"},\ \frac{2^{-\frac{1}{2}a\sim+1}\sinh(x)^{a\sim-1}e^{-\frac{1}{2}\sinh(x)^2}\cosh(x)}{\Gamma\left(\frac{1}{2}a\sim\right)} \tag{3}$$