```
> 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 := BetaRV(a,b);
  bfname := "BetaRV(a,b)";
Originally a, renamed a~:
  is assumed to be: RealRange(Open(0),infinity)

Originally b, renamed b~:
  is assumed to be: RealRange(Open(0),infinity)
```

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

$$bfname := \text{"BetaRV(a,b)"} \quad (1)$$

```
> #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);
```

$$-\ln(y) \quad (2)$$

```
> # discarded  -ln(t + 1),  t-> csch(t),t->arccsch(t),t -> tan(t),
> #name of the file for latex output
  filename := "C:/LatexOutput/BetaGen.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 := 0;
   u := infinity;
   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);
```

$$filename := \text{"C:/LatexOutput/BetaGen.tex"}$$

$$\frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1}\, (1 - x)^{b\sim - 1}}{\Gamma(a\sim)\, \Gamma(b\sim)}$$

"i is", 1,

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

$$g := t \rightarrow t^2$$
$$l := 0$$
$$u := \infty$$

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

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

$$\text{"g(x)"}, x^2, \text{"base"}, \frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1}\,(1 - x)^{b\sim - 1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 2,

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

$$g := t \rightarrow \sqrt{t}$$
$$l := 0$$
$$u := \infty$$

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

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

$$\text{"g(x)"}, \sqrt{x}, \text{"base"}, \frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1}\,(1 - x)^{b\sim - 1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 3,

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

$$g := t \rightarrow \frac{1}{t}$$
$$l := 0$$
$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, \frac{1}{x}, \text{"base"}, \frac{\Gamma(a\sim+b\sim)\, x^{a\sim-1}\, (1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 4,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, \arctan(x), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\, x^{a\sim-1}\, (1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 5,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, e^x, \text{"base"}, \frac{\Gamma(a\sim+b\sim)\, x^{a\sim-1}\, (1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 6,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, \ln(x), \text{"base"}, \frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1} (1 - x)^{b\sim - 1}}{\Gamma(a\sim)\, \Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 7,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, e^{-x}, \text{"base"}, \frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1} (1 - x)^{b\sim - 1}}{\Gamma(a\sim)\, \Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 8,

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

$$\text{"g(x)"}, -\ln(x), \text{"base"}, \frac{\Gamma(a\sim + b\sim)\, x^{a\sim - 1} (1 - x)^{b\sim - 1}}{\Gamma(a\sim)\, \Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 9,

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

----------"

$$g := t \rightarrow \ln(t+1)$$
$$l := 0$$
$$u := \infty$$

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

"l and u", 0, $\infty$

"g(x)", $\ln(x+1)$, "base", $\frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}$, "BetaRV(a,b)"

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

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

$$g := t \rightarrow \frac{1}{\ln(t+2)}$$
$$l := 0$$
$$u := \infty$$

$$Temp := \left[\left[y\sim \rightarrow \frac{\Gamma(a\sim+b\sim)\,\left(e^{\frac{1}{y\sim}}-2\right)^{a\sim-1}\,\left(3-e^{\frac{1}{y\sim}}\right)^{b\sim-1}\,e^{\frac{1}{y\sim}}}{\Gamma(a\sim)\,\Gamma(b\sim)\,y\sim^{2}}\right], \left[\frac{1}{\ln(3)}, \frac{1}{\ln(2)}\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$

"l and u", 0, $\infty$

"g(x)", $\frac{1}{\ln(x+2)}$, "base", $\frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}$, "BetaRV(a,b)"

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

"i is", 11,
" ----------------------------------------------------------------------------------------------------------
----------"

$$g := t \rightarrow \tanh(t)$$
$$l := 0$$
$$u := \infty$$

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

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

$$\text{"g(x)"}, \tanh(x), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 12,
" ------------------------------------------------------------------------------------------------------------------------"

$$g := t \rightarrow \sinh(t)$$
$$l := 0$$
$$u := \infty$$

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

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

$$\text{"g(x)"}, \sinh(x), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 13,
" ------------------------------------------------------------------------------------------------------------------------"

$$g := t \rightarrow \operatorname{arcsinh}(t)$$
$$l := 0$$
$$u := \infty$$

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

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

$$\text{"g(x)"}, \operatorname{arcsinh}(x), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 14,
" -------------------------------------------------------------------------------------------------------------
----------"

$$g := t \rightarrow \mathrm{csch}(t+1)$$

$$l := 0$$

$$u := \infty$$

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

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

$$\text{"g(x)"}, \mathrm{csch}(x+1), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

$$\text{"f(x)"}, \frac{\Gamma(a\sim+b\sim)\,(-1+\mathrm{arccsch}(x))^{a\sim-1}\,(2-\mathrm{arccsch}(x))^{b\sim-1}}{\sqrt{x^2+1}\,\Gamma(a\sim)\,\Gamma(b\sim)\,|x|}$$

"i is", 15,
" -------------------------------------------------------------------------------------------------------------
----------"

$$g := t \rightarrow \mathrm{arccsch}(t+1)$$

$$l := 0$$

$$u := \infty$$

$$Temp := \left[\left[y\sim \rightarrow -\frac{\Gamma(a\sim+b\sim)\left(-\frac{\sinh(y\sim)-1}{\sinh(y\sim)}\right)^{a\sim}\left(\frac{2\sinh(y\sim)-1}{\sinh(y\sim)}\right)^{b\sim}\cosh(y\sim)}{\Gamma(a\sim)\,\Gamma(b\sim)\,(\sinh(y\sim)-1)\,(2\sinh(y\sim)-1)}\right], \left[\ln(2)-\ln\left(\sqrt{5}-1\right), \ln\left(1+\sqrt{2}\right)\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$

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

$$\text{"g(x)"}, \mathrm{arccsch}(x+1), \text{"base"}, \frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 16,
" -------------------------------------------------------------------------------------------------------------
----------"

$$g := t \rightarrow \frac{1}{\tanh(t+1)}$$
$$l := 0$$
$$u := \infty$$
$$Temp := \left[\left[y\sim \rightarrow \frac{\Gamma(a\sim+b\sim)\left(-1+\operatorname{arctanh}\left(\frac{1}{y\sim}\right)\right)^{a\sim-1}\left(2-\operatorname{arctanh}\left(\frac{1}{y\sim}\right)\right)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)\,(y\sim^2-1)}\right],\right.$$
$$\left.\left[\frac{-e^{-2}-e^{2}}{e^{-2}-e^{2}}, \frac{e+e^{-1}}{e-e^{-1}}\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$
"l and u", 0, $\infty$

"g(x)", $\frac{1}{\tanh(x+1)}$, "base", $\frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}$, "BetaRV(a,b)"

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

"i is", 17,
" ----------------------------------------------------------------------------------------------------------
----------"

$$g := t \rightarrow \frac{1}{\sinh(t+1)}$$
$$l := 0$$
$$u := \infty$$
$$Temp := \left[\left[y\sim \rightarrow \frac{\Gamma(a\sim+b\sim)\left(-1+\operatorname{arcsinh}\left(\frac{1}{y\sim}\right)\right)^{a\sim-1}\left(2-\operatorname{arcsinh}\left(\frac{1}{y\sim}\right)\right)^{b\sim-1}}{\sqrt{y\sim^2+1}\,\Gamma(a\sim)\,\Gamma(b\sim)\,|y\sim|}\right],\right.$$
$$\left.\left[-\frac{2}{e^{-2}-e^{2}}, \frac{2}{e-e^{-1}}\right], [\text{"Continuous"}, \text{"PDF"}]\right]$$
"l and u", 0, $\infty$

"g(x)", $\frac{1}{\sinh(x+1)}$, "base", $\frac{\Gamma(a\sim+b\sim)\,x^{a\sim-1}\,(1-x)^{b\sim-1}}{\Gamma(a\sim)\,\Gamma(b\sim)}$, "BetaRV(a,b)"

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

"i is", 18,
" ----------------------------------------------------------------------------------------------------------
----------"

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

$$l := 0$$

$$u := \infty$$

$$Temp := \left[ \left[ y\sim \to \frac{\Gamma(a\sim + b\sim) \left(-1 + \sinh\left(\frac{1}{y\sim}\right)\right)^{a\sim - 1} \left(2 - \sinh\left(\frac{1}{y\sim}\right)\right)^{b\sim - 1} \cosh\left(\frac{1}{y\sim}\right)}{\Gamma(a\sim)\,\Gamma(b\sim)\,y\sim^2} \right], \left[ -\frac{1}{\ln(\sqrt{5} - 2)}, \frac{1}{\ln(1 + \sqrt{2})} \right], [\text{"Continuous"}, \text{"PDF"}] \right]$$

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

$$\text{"g(x)"}, \frac{1}{\operatorname{arcsinh}(x+1)}, \text{"base"}, \frac{\Gamma(a\sim + b\sim)\,x^{a\sim - 1}\,(1-x)^{b\sim - 1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 19,

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

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

$$l := 0$$

$$u := \infty$$

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

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

$$\text{"g(x)"}, \frac{1}{\operatorname{csch}(x)} + 1, \text{"base"}, \frac{\Gamma(a\sim + b\sim)\,x^{a\sim - 1}\,(1-x)^{b\sim - 1}}{\Gamma(a\sim)\,\Gamma(b\sim)}, \text{"BetaRV(a,b)"}$$

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

"i is", 20,

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

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

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

"i is", 21,
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$$g := t \to \operatorname{csch}\left(\frac{1}{t}\right)$$

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

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

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

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

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

$$l := 0$$

$$u := \infty$$

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

"l and u", 0, $\infty$

"g(x)", $\operatorname{arccsch}\left(\frac{1}{x}\right)$, "base", $\frac{\Gamma(a\sim + b\sim)\,x^{a\sim - 1}\,(1 - x)^{b\sim - 1}}{\Gamma(a\sim)\,\Gamma(b\sim)}$, "BetaRV(a,b)"

"f(x)", $\frac{\Gamma(a\sim + b\sim)\,\sinh(x)^{a\sim - 1}\,(1 - \sinh(x))^{b\sim - 1}\cosh(x)}{\Gamma(a\sim)\,\Gamma(b\sim)}$ **(3)**