

```
> 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, $n \geq r$
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 := GeneralizedParetoRV(2,3,4);
bfname := "GeneralizedParetoRV(2,3,4)";
```

$$bf := \left[\left[x \rightarrow \frac{\left(2 + \frac{4}{x+3} \right) e^{-2x}}{\left(1 + \frac{1}{3} x \right)^4}, [0, \infty], ["Continuous", "PDF"] \right]$$

bfname := "GeneralizedParetoRV(2,3,4)"

(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);
```

$-\ln(y)$

(2)

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

  PlotDist(PDF(Temp), 0, 40);
  PlotDist(HF(Temp), 0, 40);

od;
```

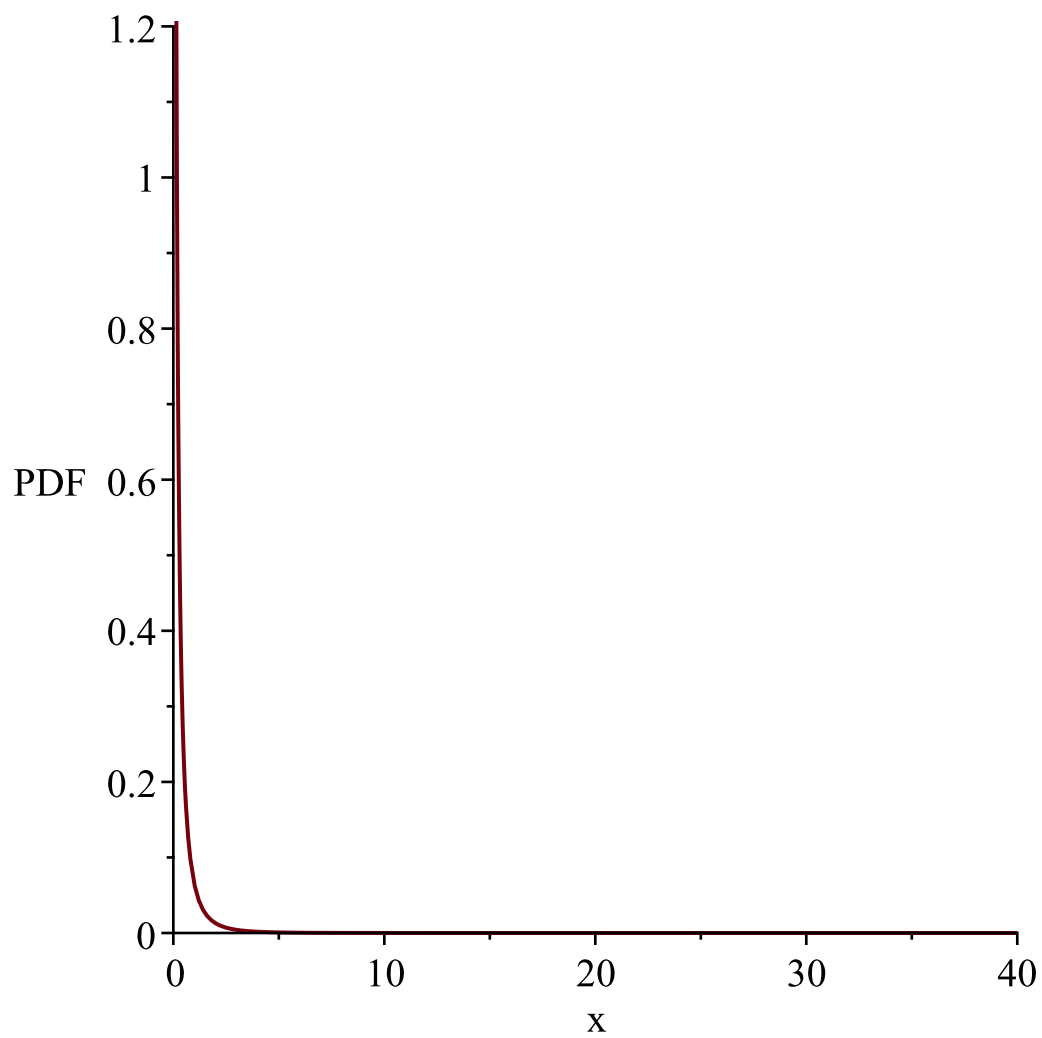
```
filename := "C:/LatexOutput/Trash.tex"
```

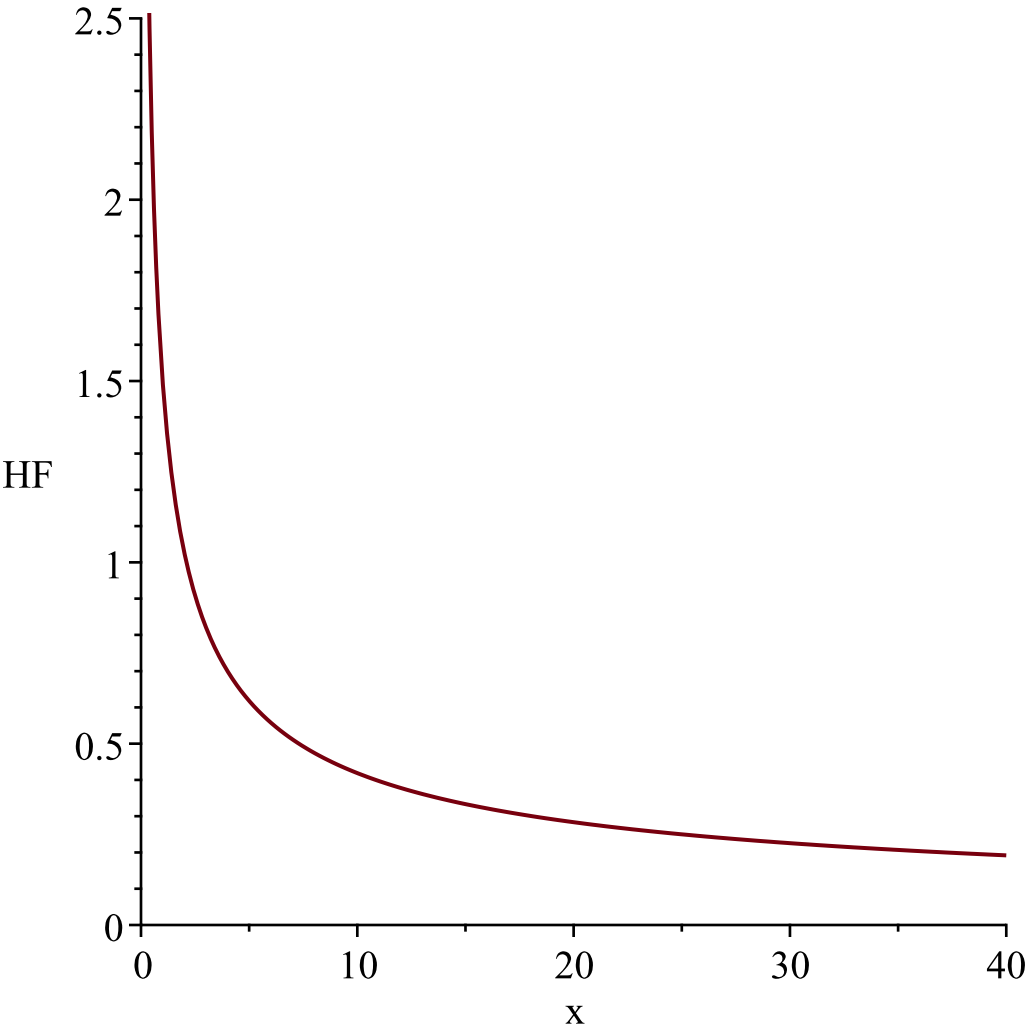
$$\frac{\left(2+\frac{4}{x+3}\right)e^{-2x}}{\left(1+\frac{1}{3}x\right)^4}$$

```
"i is", 1,
" -----"
-----"
```

```
g := t→t^2
l := 0
u := ∞
```

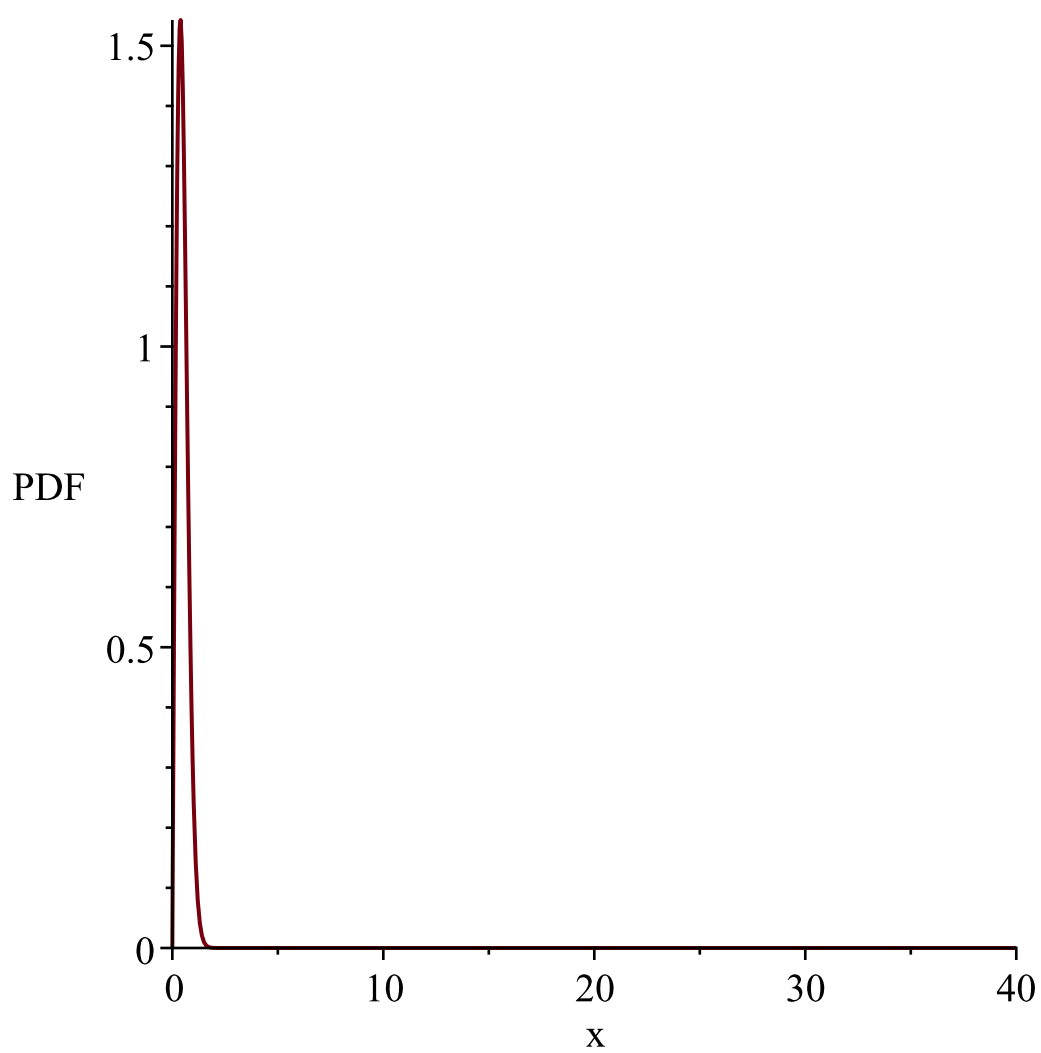
$$Temp := \left[\left[y \rightsquigarrow \frac{81 \left(\sqrt{y \sim} + 5 \right) e^{-2 \sqrt{y \sim}}}{\left(\sqrt{y \sim} + 3 \right)^5 \sqrt{y \sim}} \right], [0, \infty], ["Continuous", "PDF"] \right]$$

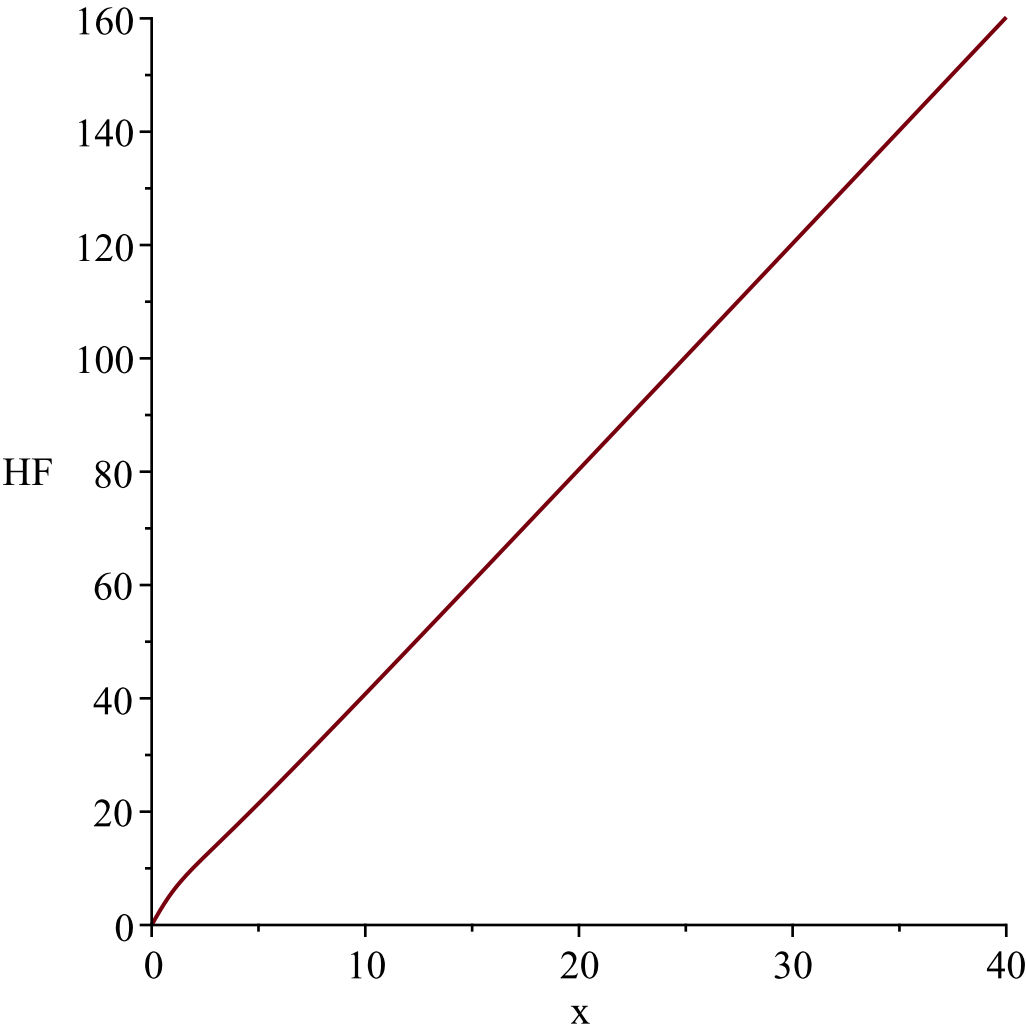




"i is", 2,
" _____"
"_____"

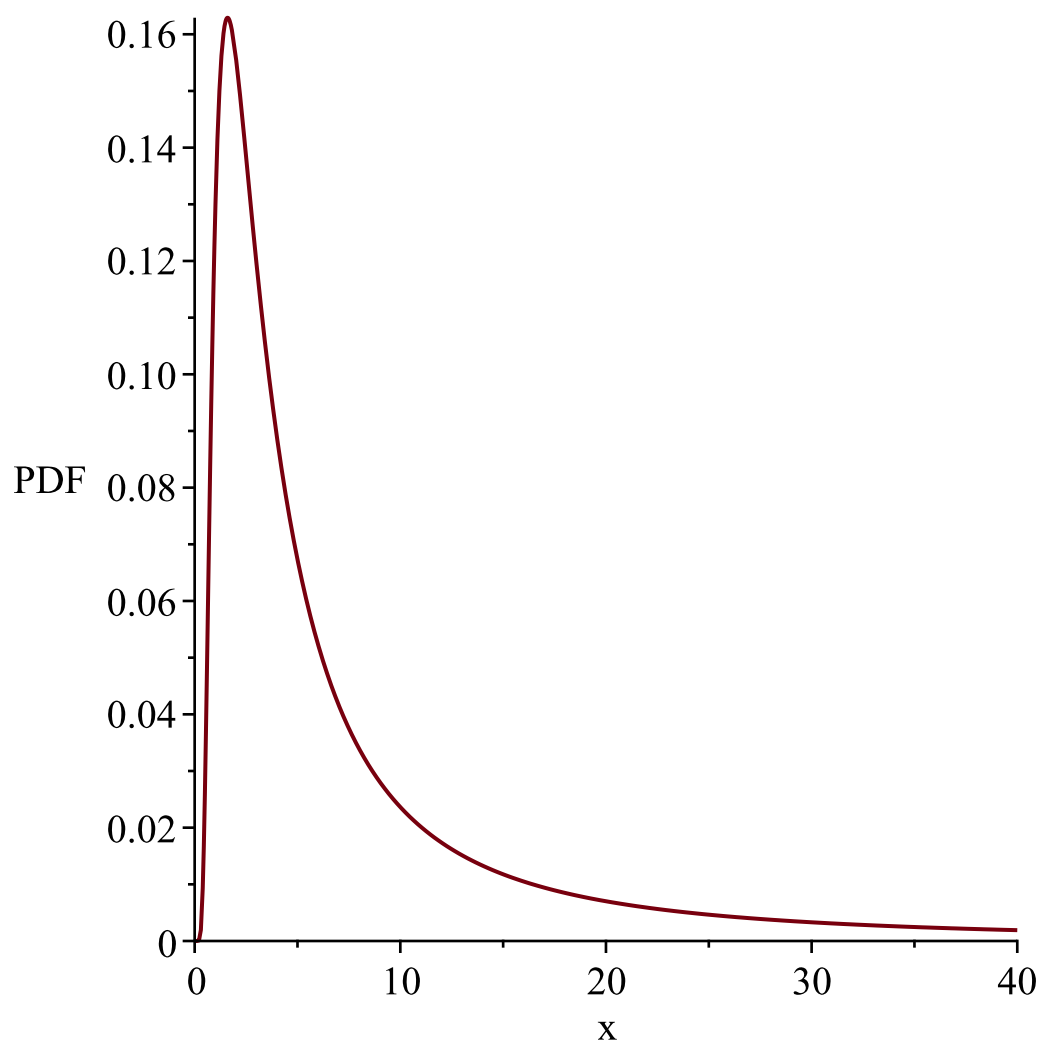
$$\begin{aligned} g &:= t \rightarrow \sqrt{t} \\ l &:= 0 \\ u &:= \infty \\ Temp &:= \left[\left[y \leadsto \frac{324 \left(y^2 + 5 \right) e^{-2 y^2} y}{\left(y^2 + 3 \right)^5} \right], [0, \infty], ["Continuous", "PDF"] \right] \end{aligned}$$

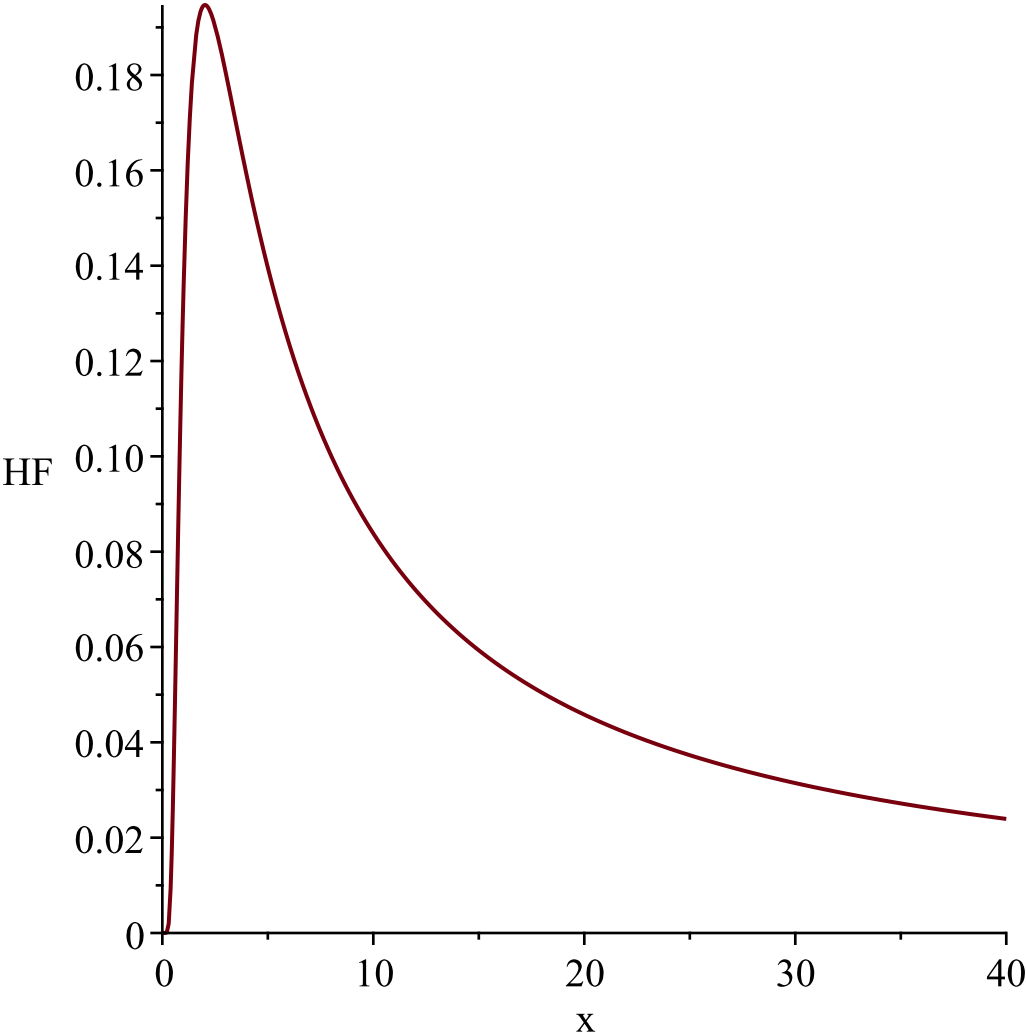




"i is", 3,
" _____"
"_____"

$$\begin{aligned} g &:= t \mapsto \frac{1}{t} \\ l &:= 0 \\ u &:= \infty \\ Temp &:= \left[\left[y \rightsquigarrow \frac{162 \, (1 + 5 \, y \rightsquigarrow) \, e^{-\frac{2}{y \rightsquigarrow}} \, y \rightsquigarrow^2}{(1 + 3 \, y \rightsquigarrow)^5} \right], [0, \, \infty], ["Continuous", "PDF"] \right] \end{aligned}$$

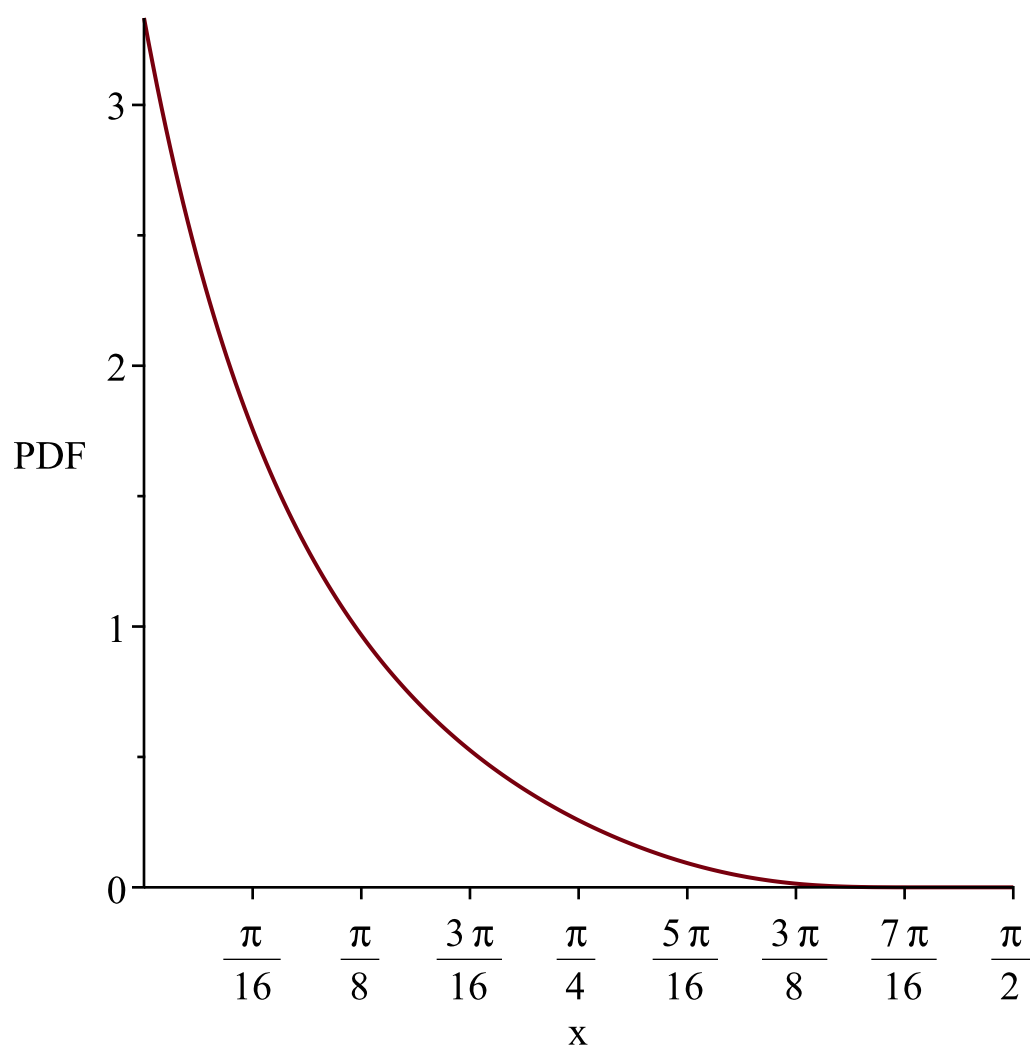




"i is", 4,
"-----"
-----"

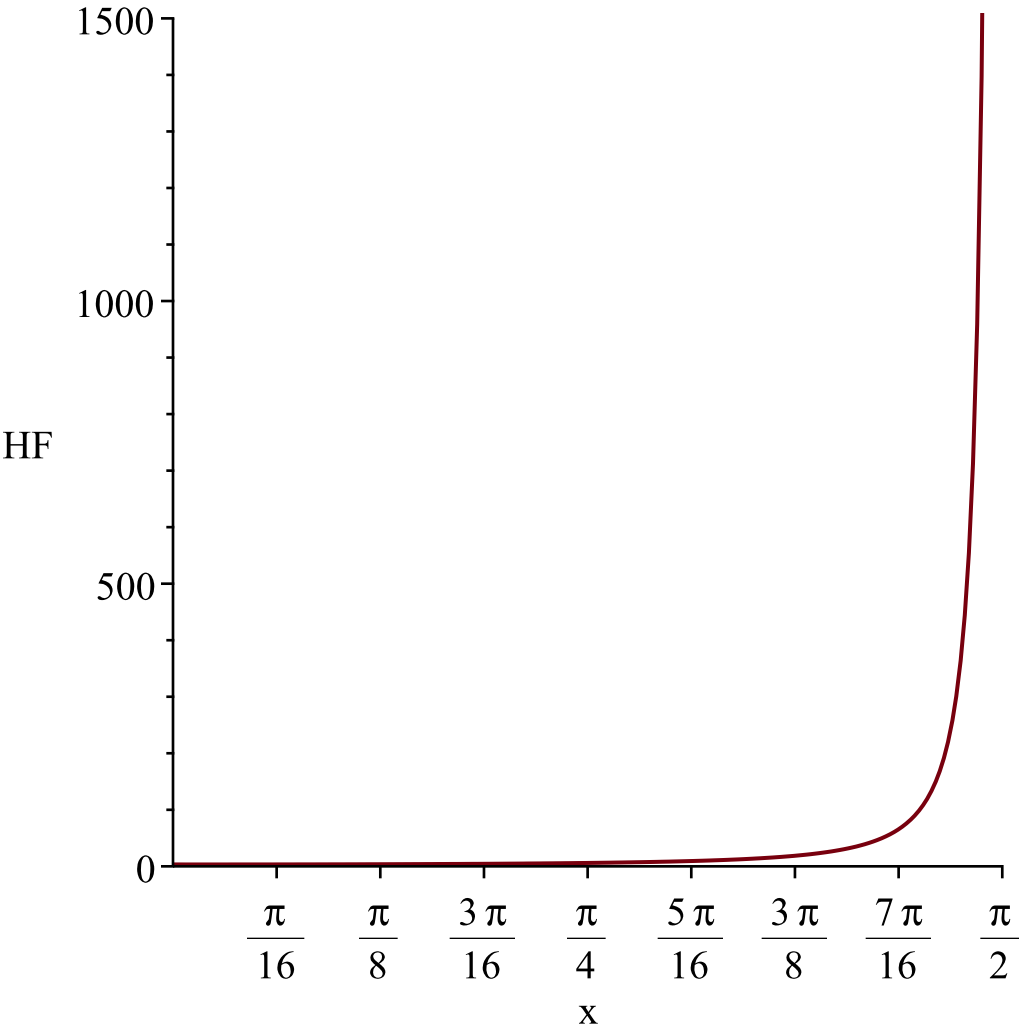
```
g := t→arctan(t)
l := 0
u := ∞
Temp := ⌈⌊y~→ 162 (tan(y~) + 5) e-2 tan(y~) (1 + tan(y~)2) / (tan(y~) + 3)5⌋, ⌊0, 1/2 π⌋, ["Continuous",
"PDF"]⌋
```

*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random
variable, $\frac{1}{2} \pi$
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, $\frac{1}{2} \pi$*

Resetting high to RV's maximum support value



"i is", 5,
"-----"
-----"

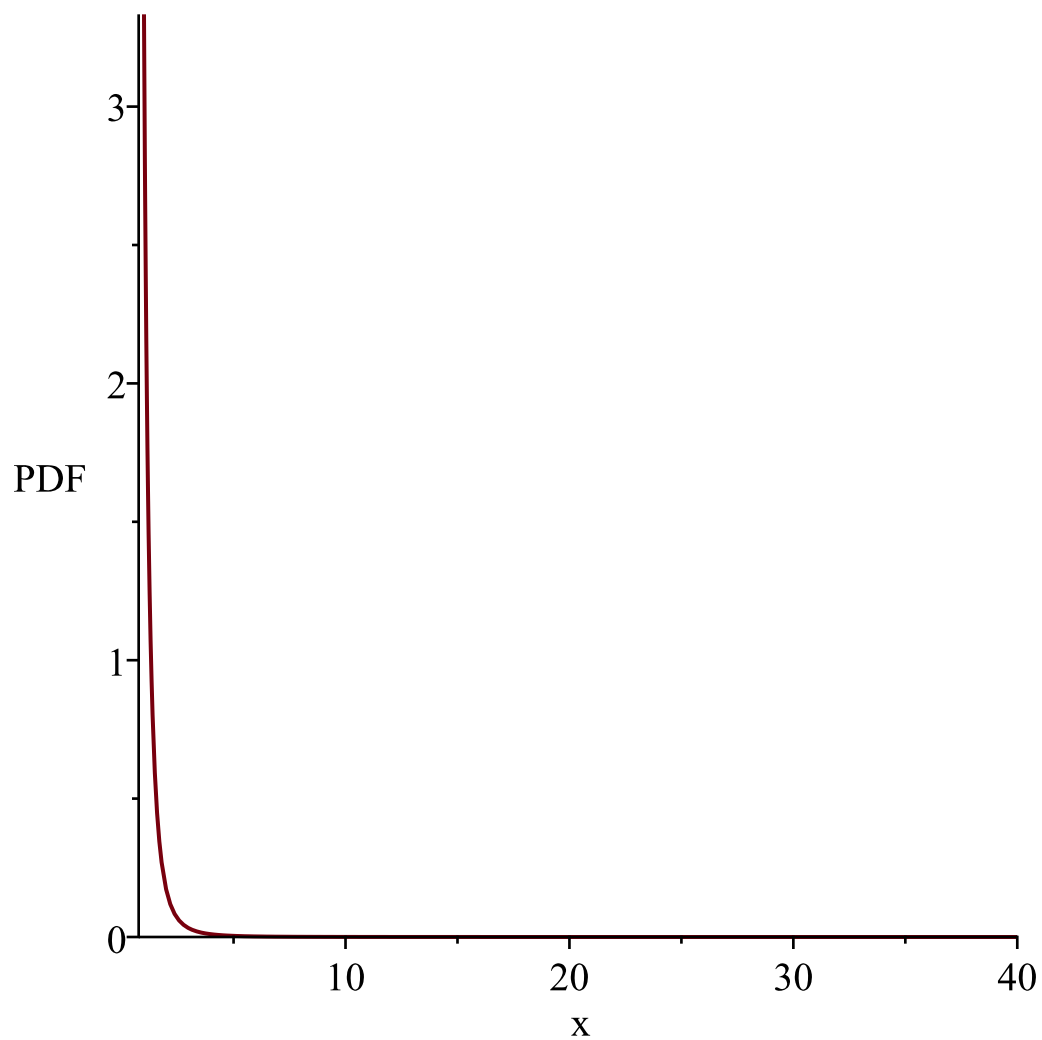
$$g := t \rightarrow e^t$$
$$l := 0$$
$$u := \infty$$

$$Temp := \left[\left[y \sim \frac{162 (\ln(y) + 5)}{(\ln(y) + 3)^5 y^3} \right], [1, \infty], ["Continuous", "PDF"] \right]$$

*WARNING(PlotDist): Low value provided by user, 0
is less than minimum support value of random variable*

1

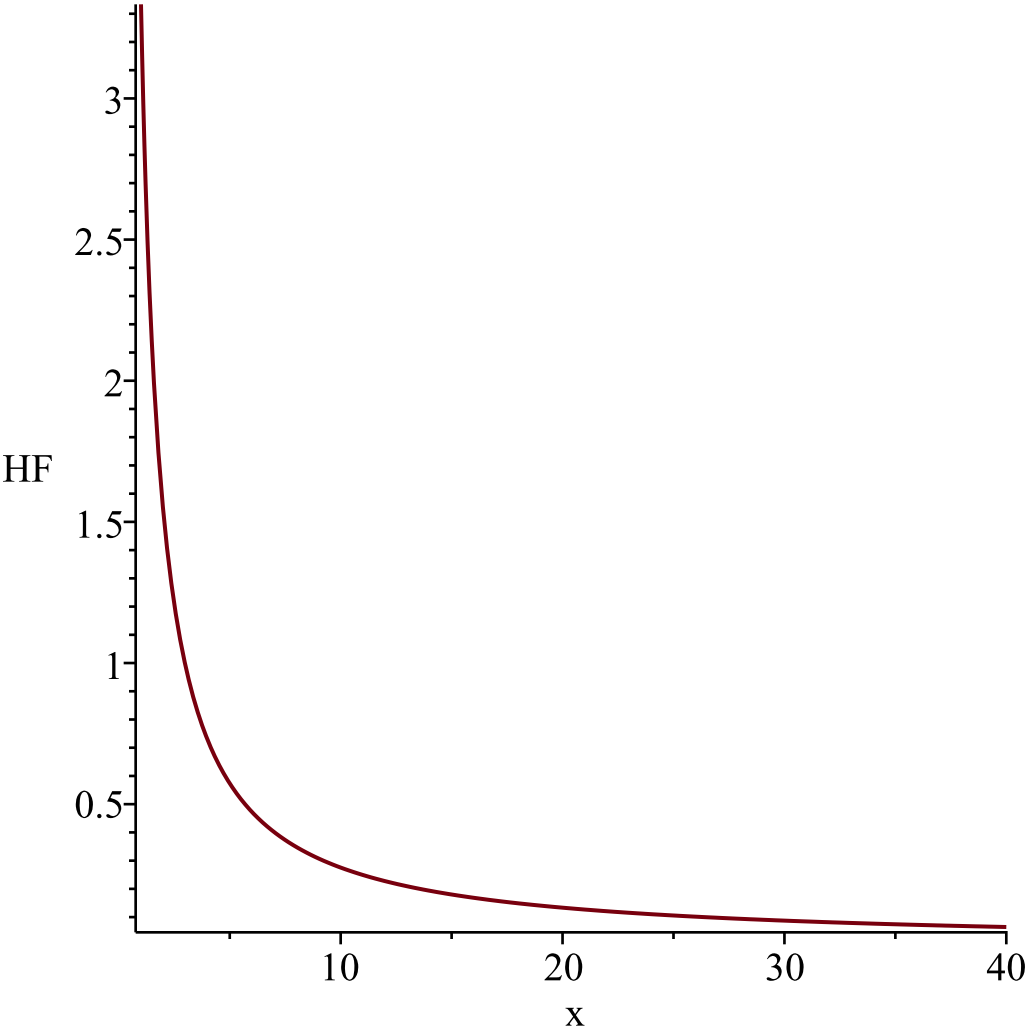
Resetting low to RV's minimum support value



*WARNING(PlotDist): Low value provided by user, 0
is less than minimum support value of random variable*

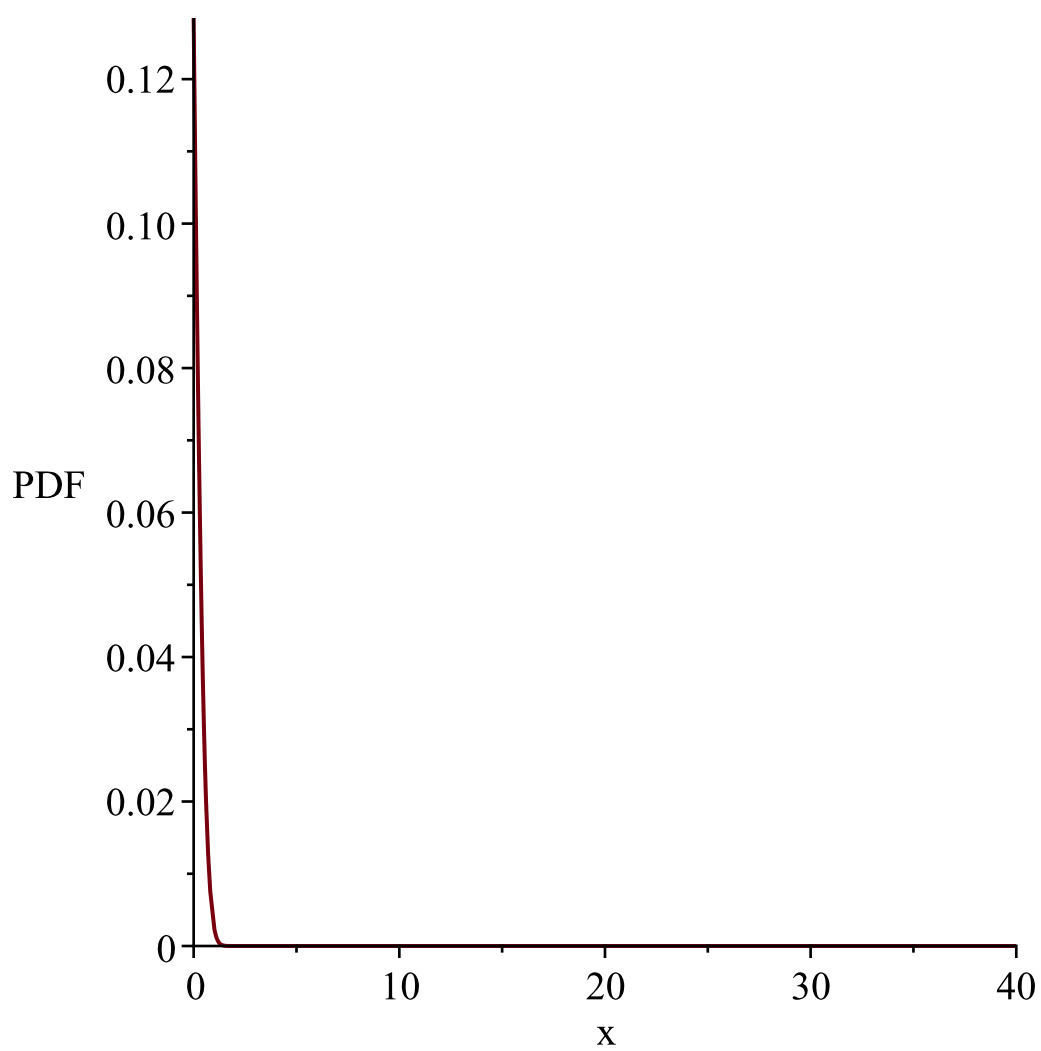
1

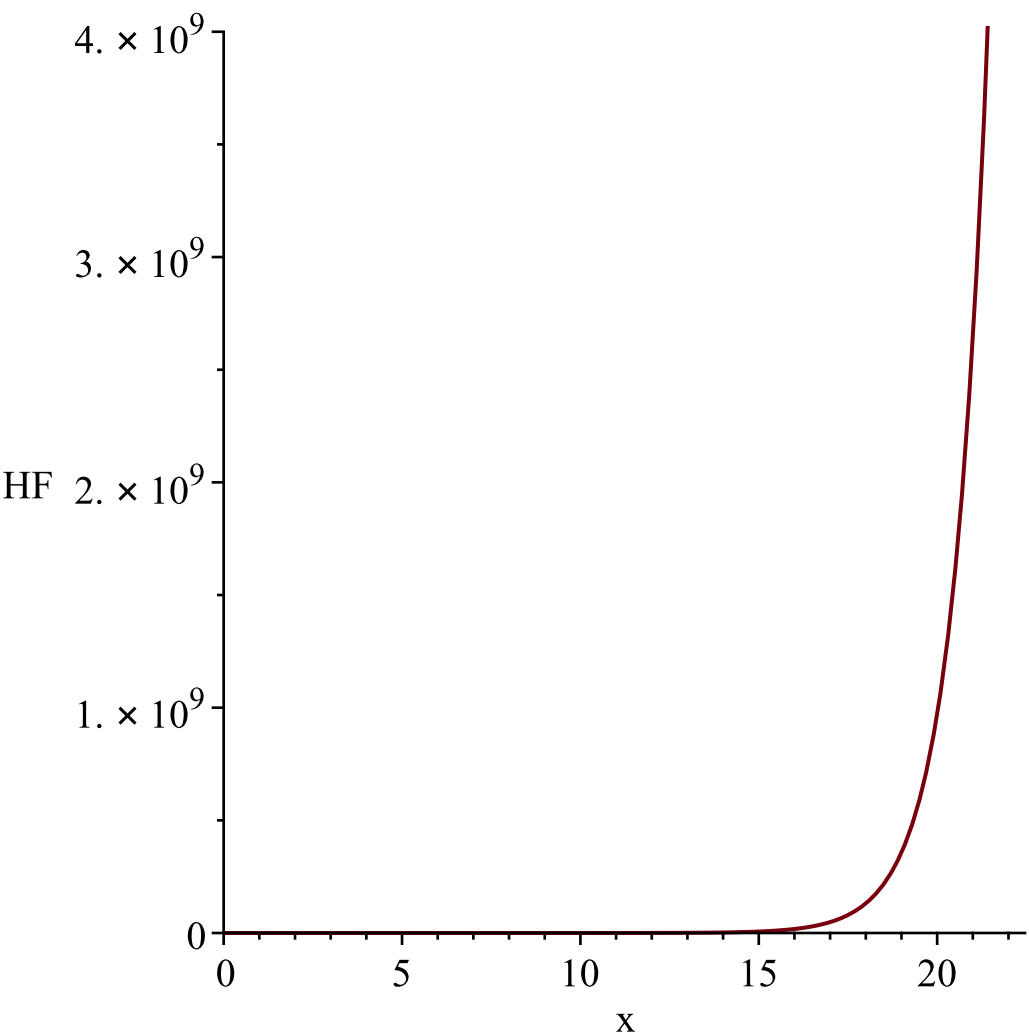
Resetting low to RV's minimum support value



"i is", 6,
" _____"
"_____"

$$\begin{aligned} g &:= t \rightarrow \ln(t) \\ l &:= 0 \\ u &:= \infty \\ Temp &:= \left[\left[y_{\sim} \rightarrow \frac{162 \left(e^{y_{\sim}} + 5 \right) e^{-2 e^{y_{\sim}} + y_{\sim}}}{\left(e^{y_{\sim}} + 3 \right)^5} \right], \left[-\infty, \infty \right], \left[\text{"Continuous"}, \text{"PDF"} \right] \right] \end{aligned}$$



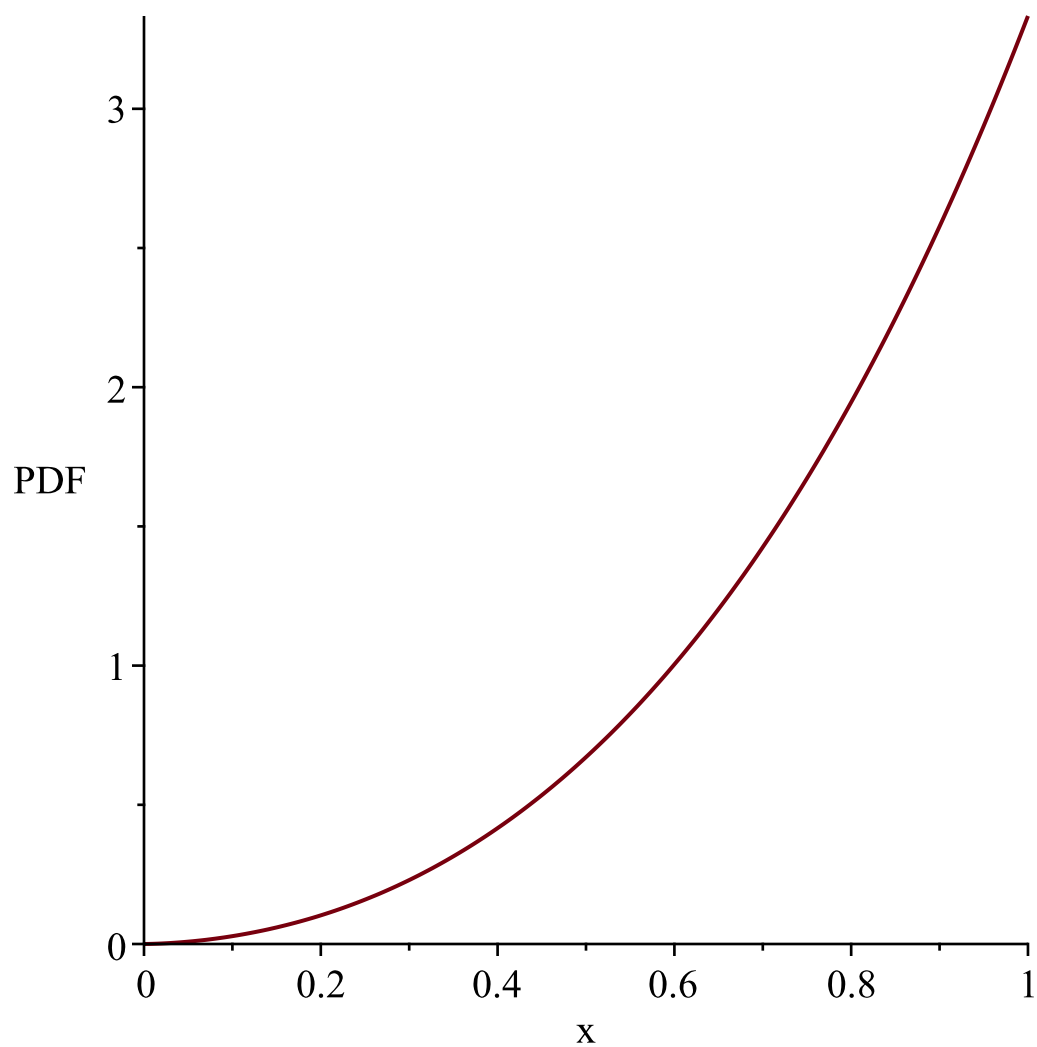


"i is", 7,
"-----"
-----"

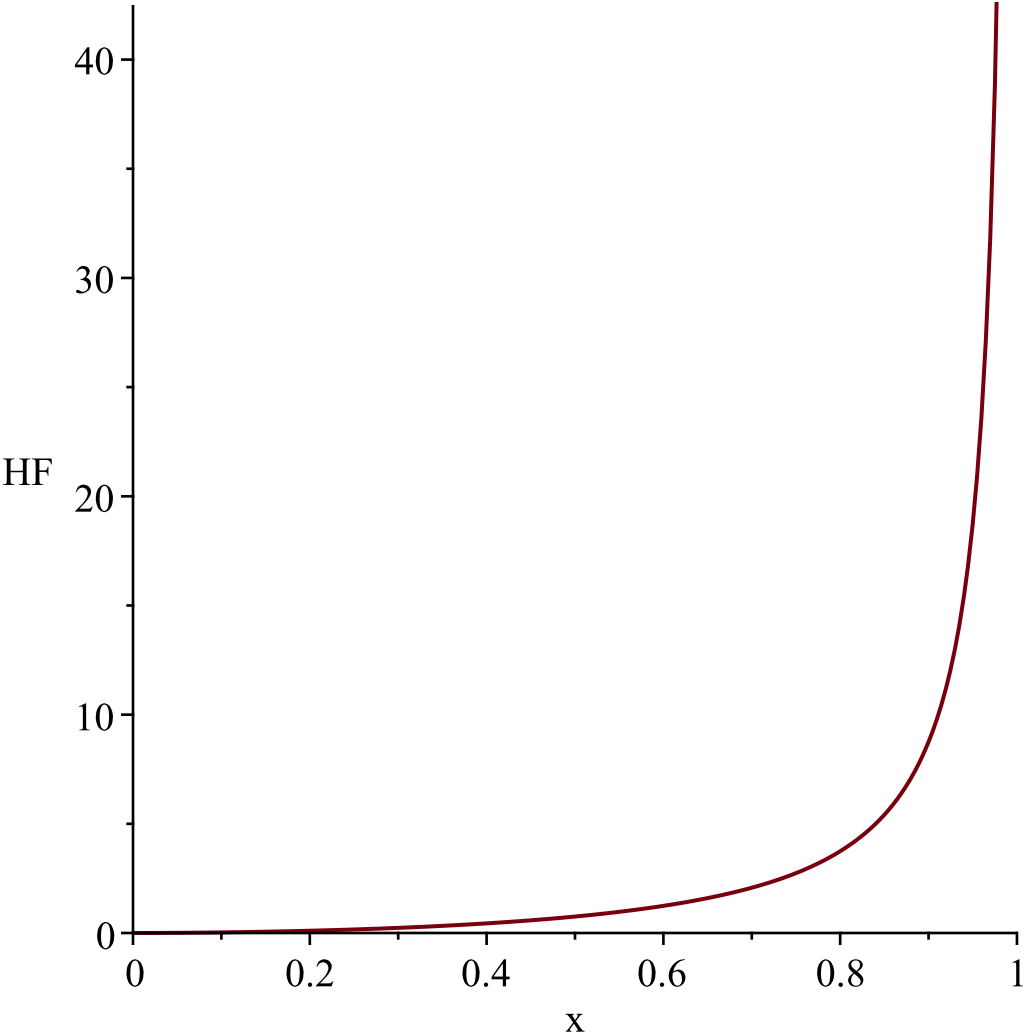
$$g := t \rightarrow e^{-t}$$
$$l := 0$$
$$u := \infty$$

$$Temp := \left[\left[y \sim \rightarrow \frac{162 \left(\ln(y \sim) - 5 \right) y \sim}{\left(\ln(y \sim) - 3 \right)^5} \right], [0, 1], ["Continuous", "PDF"] \right]$$

*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random
variable, 1
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, 1
Resetting high to RV's maximum support value*



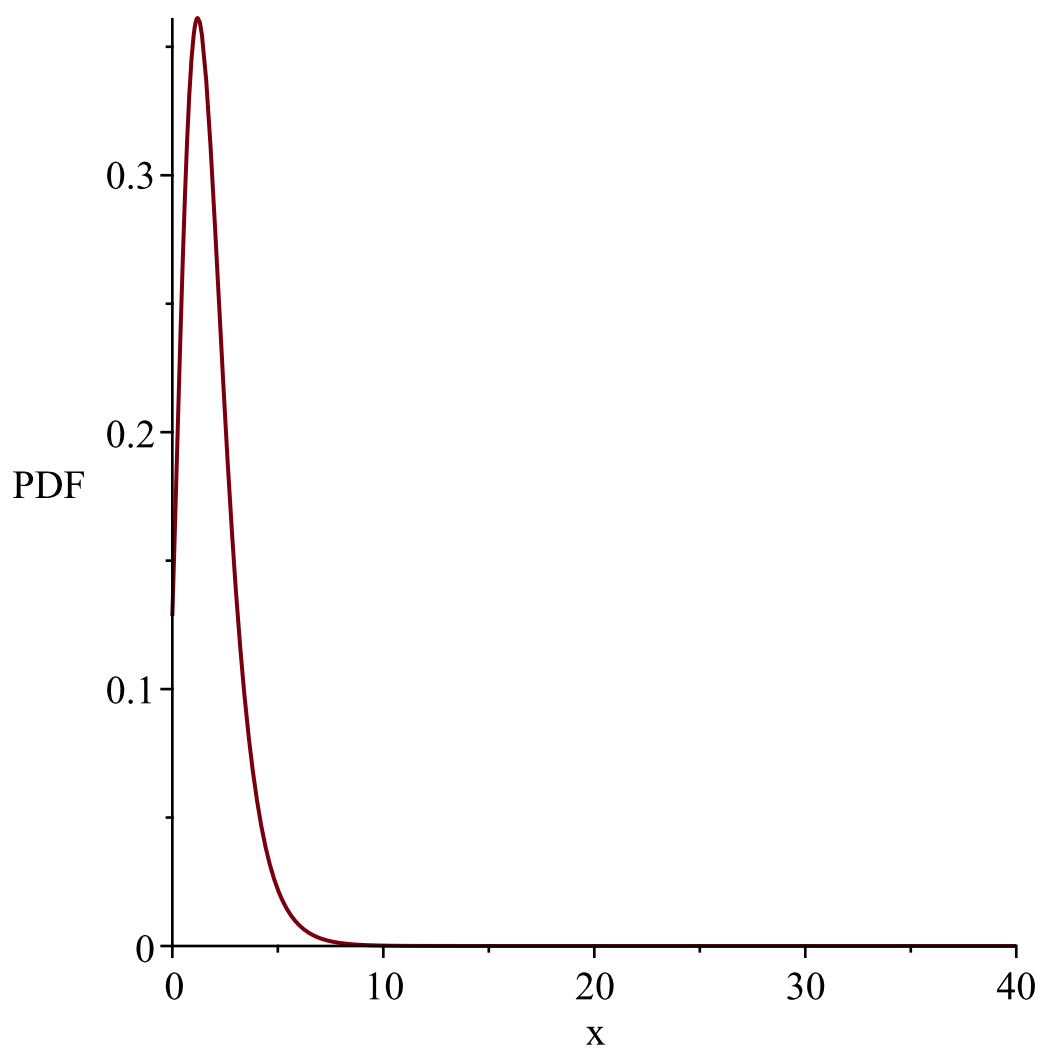
"i is", 8,
" _____
-----"

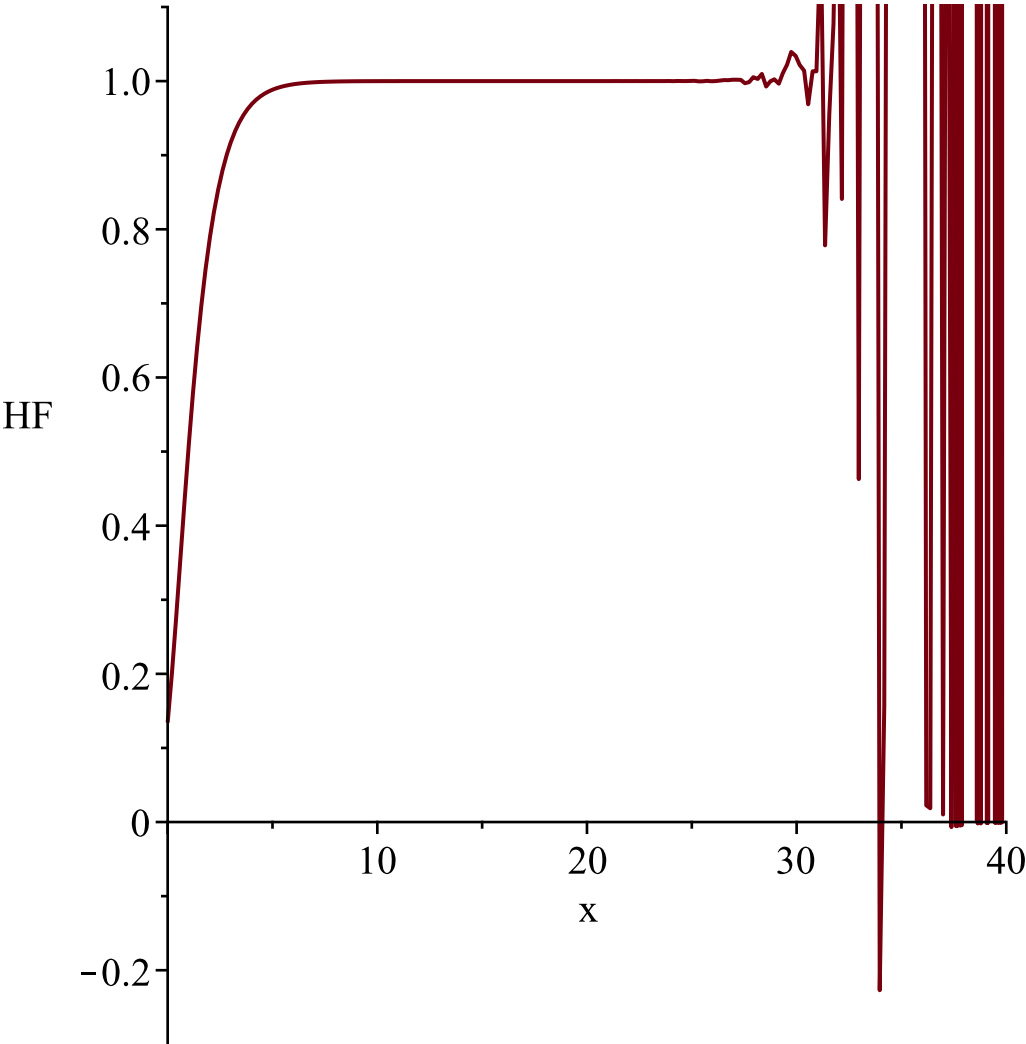
$$g := t \rightarrow -\ln(t)$$

$$l := 0$$

$$u := \infty$$

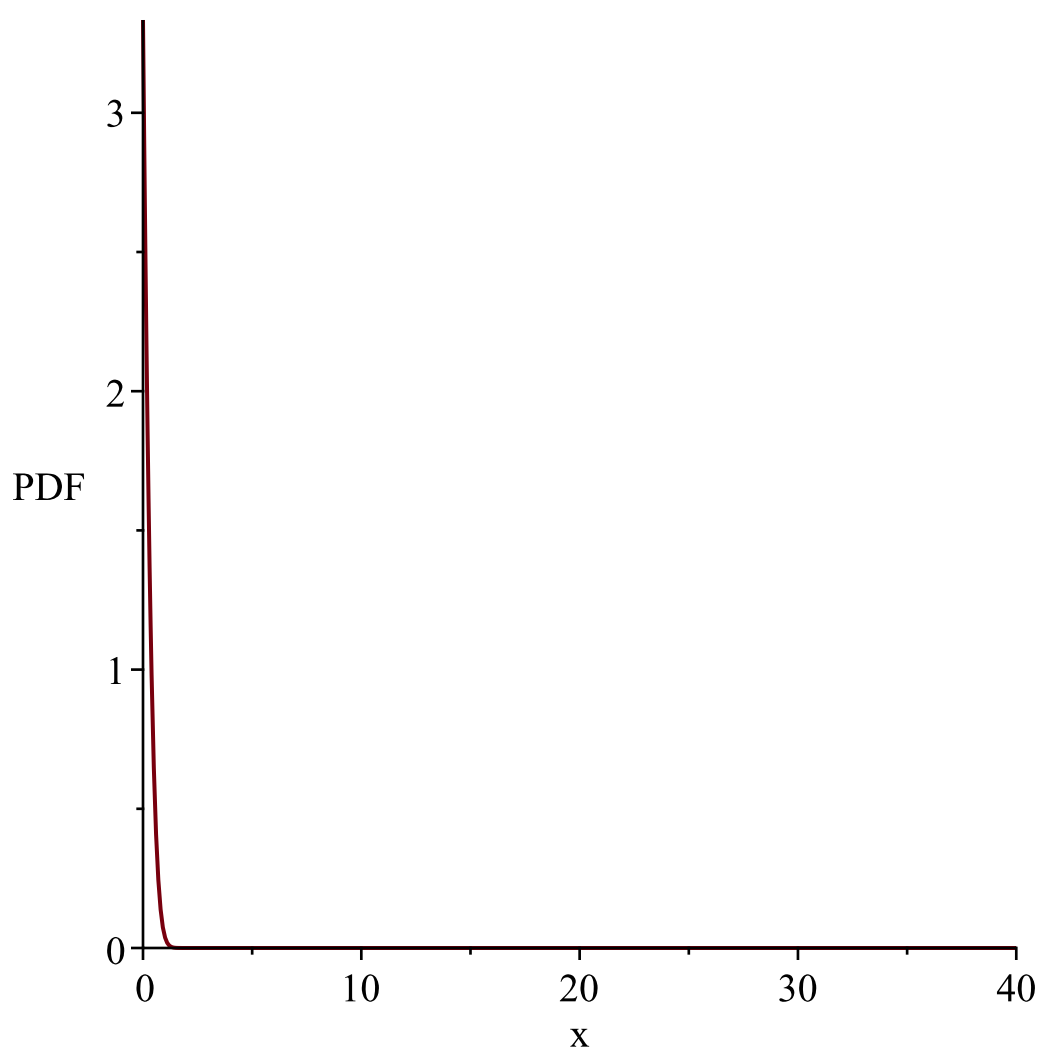
$$Temp := \left[\left[y \rightsquigarrow \frac{162 \left(1 + 5 \, e^{y \sim} \right) \, e^{\left(3 \, y \sim e^{y \sim} - 2 \right) e^{-y \sim}}}{\left(1 + 3 \, e^{y \sim} \right)^5} \right], \left[-\infty, \infty \right], \left[\text{"Continuous"}, \text{"PDF"} \right] \right]$$

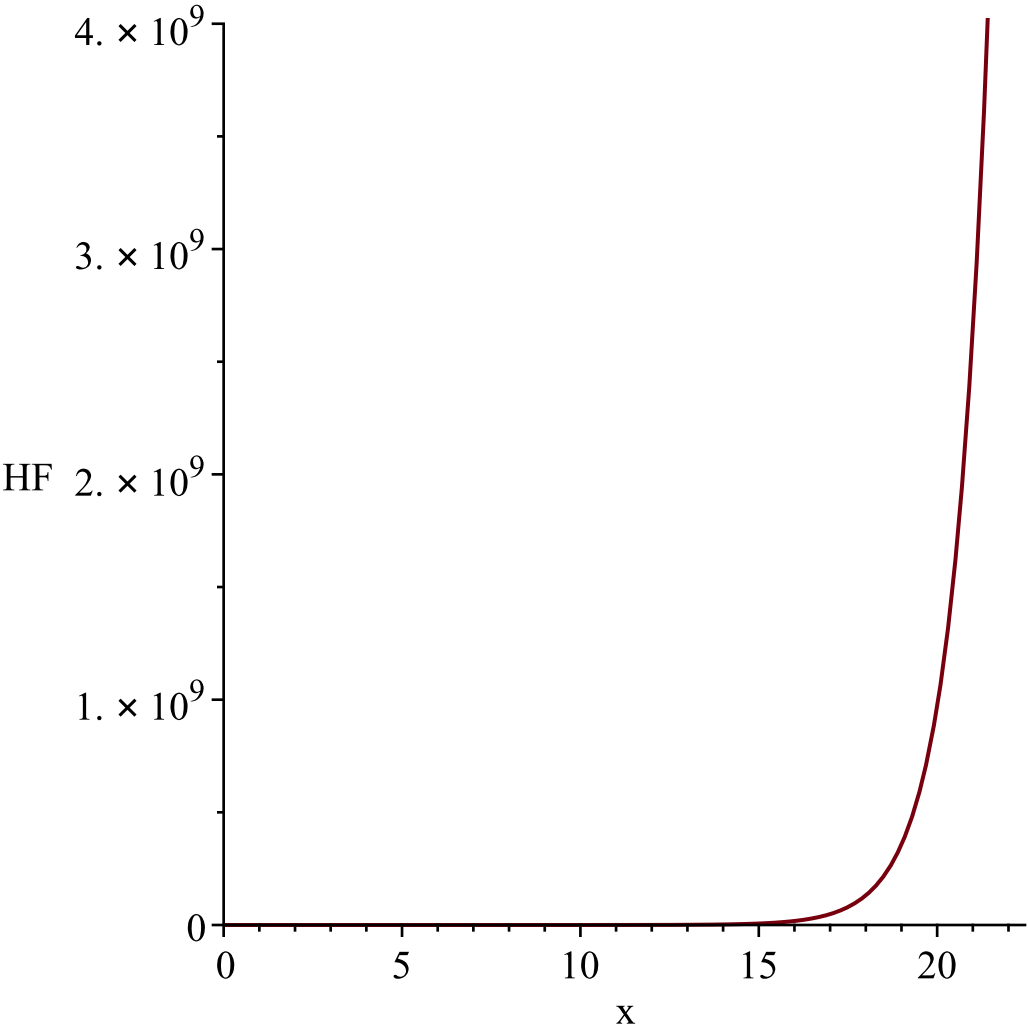




"i is", 9,
"-----"
-----"

$$\begin{aligned} g &:= t \rightarrow \ln(t+1) \\ l &:= 0 \\ u &:= \infty \\ Temp &:= \left[\left[y_{\sim} \rightarrow \frac{162 \left(e^{y_{\sim}} + 4 \right) e^{-2 e^{y_{\sim}} + 2 + y_{\sim}}}{\left(e^{y_{\sim}} + 2 \right)^5} \right], [0, \infty], ["Continuous", "PDF"] \right] \end{aligned}$$





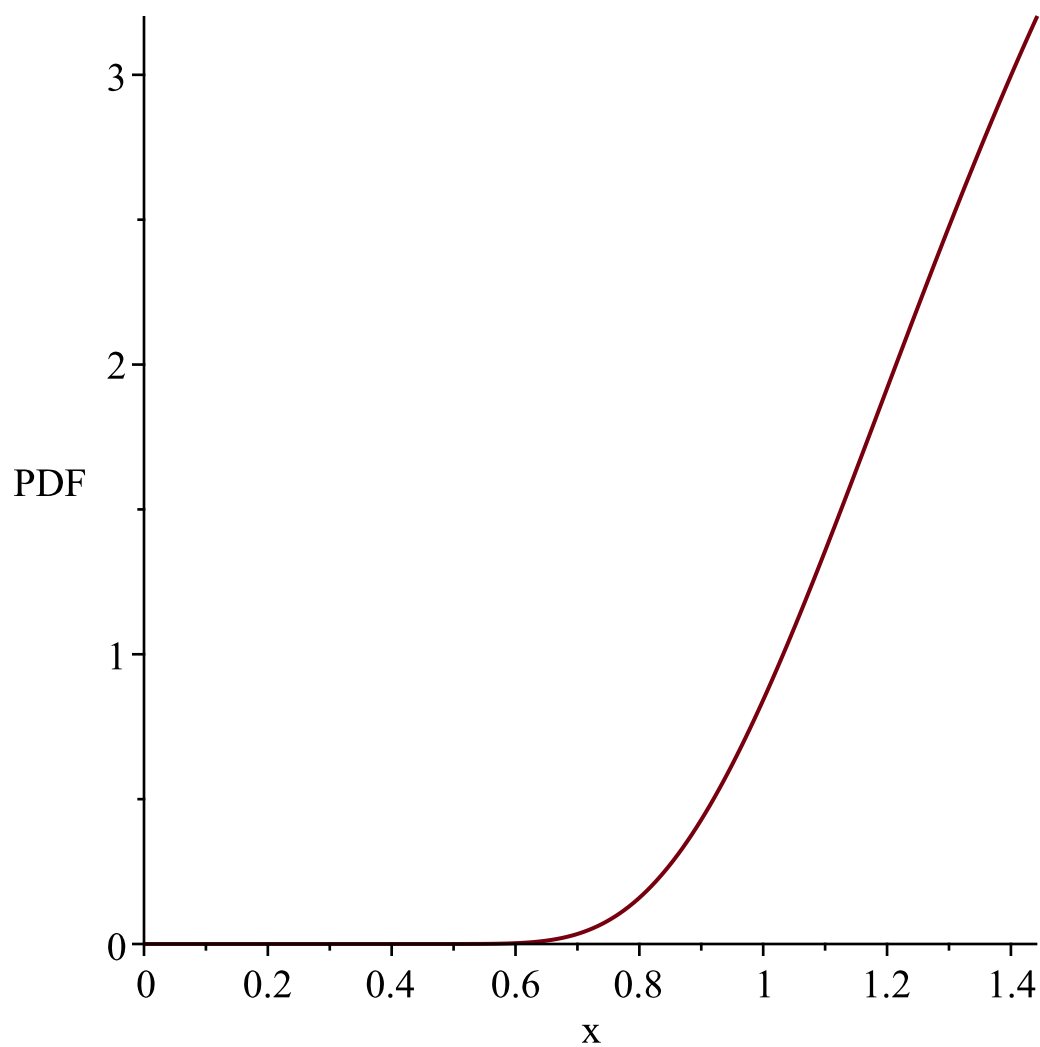
"i is", 10,
"-----"
"-----"

$$g := t \rightarrow \frac{1}{\ln(t + 2)}$$
$$l := 0$$
$$u := \infty$$
$$Temp := \left[\left[y \sim \rightarrow \frac{162 \left(e^{\frac{1}{y \sim}} + 3 \right) e^{-\frac{\frac{1}{y \sim}}{2 e^{y \sim} y \sim - 4 y \sim - 1}}}{\left(e^{\frac{1}{y \sim}} + 1 \right)^5 y \sim^2} \right], \left[0, \frac{1}{\ln(2)} \right], ["Continuous", "PDF"] \right]$$

*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random*

variable, $\frac{1}{\ln(2)}$

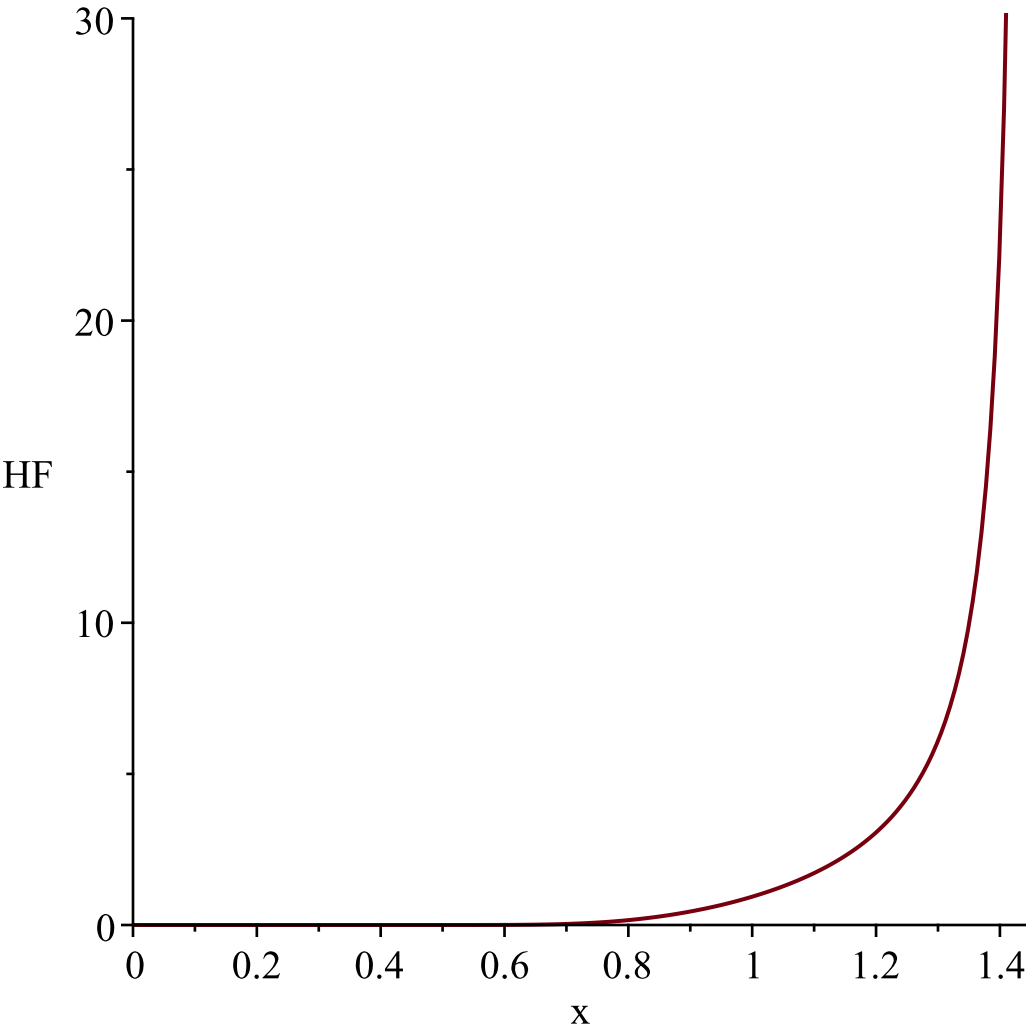
Resetting high to RV's maximum support value



*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random*

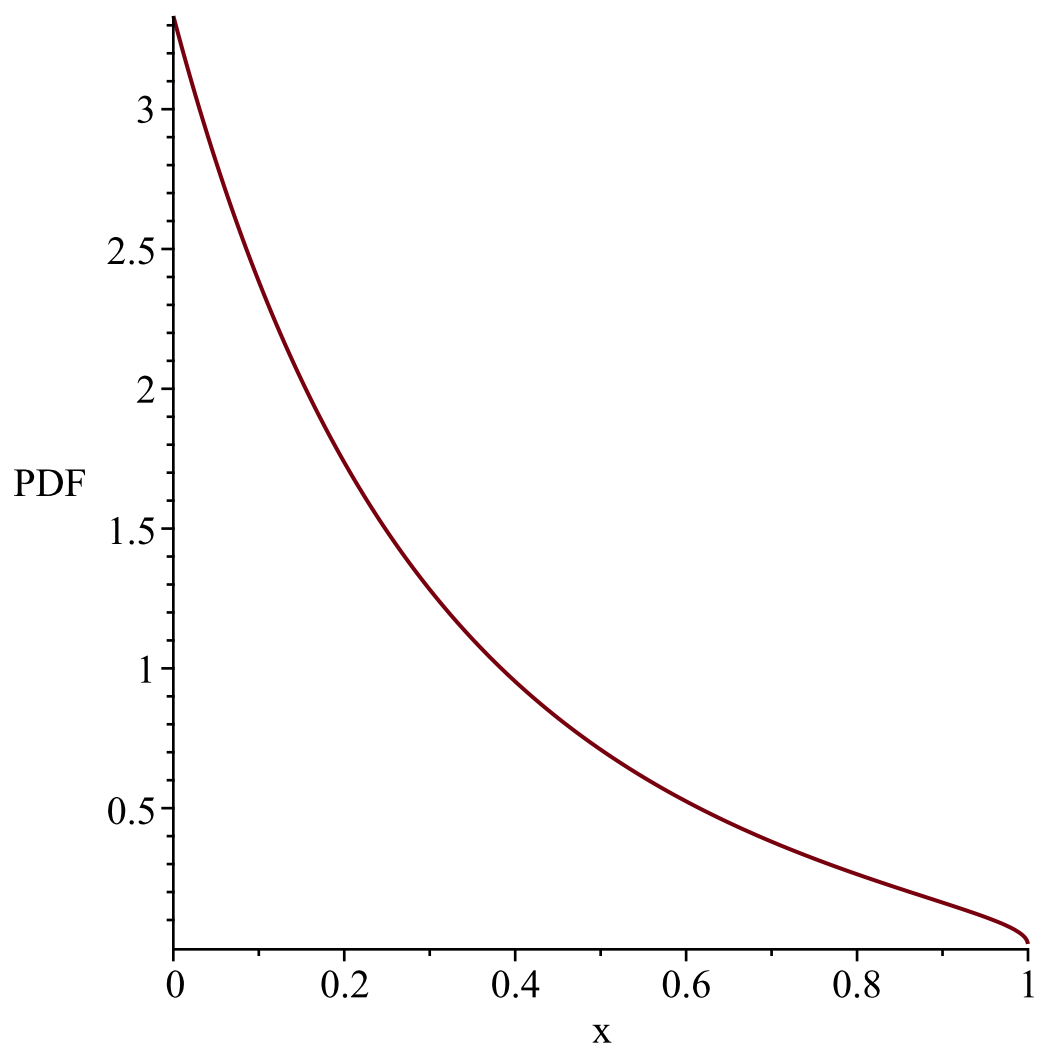
variable, $\frac{1}{\ln(2)}$

Resetting high to RV's maximum support value

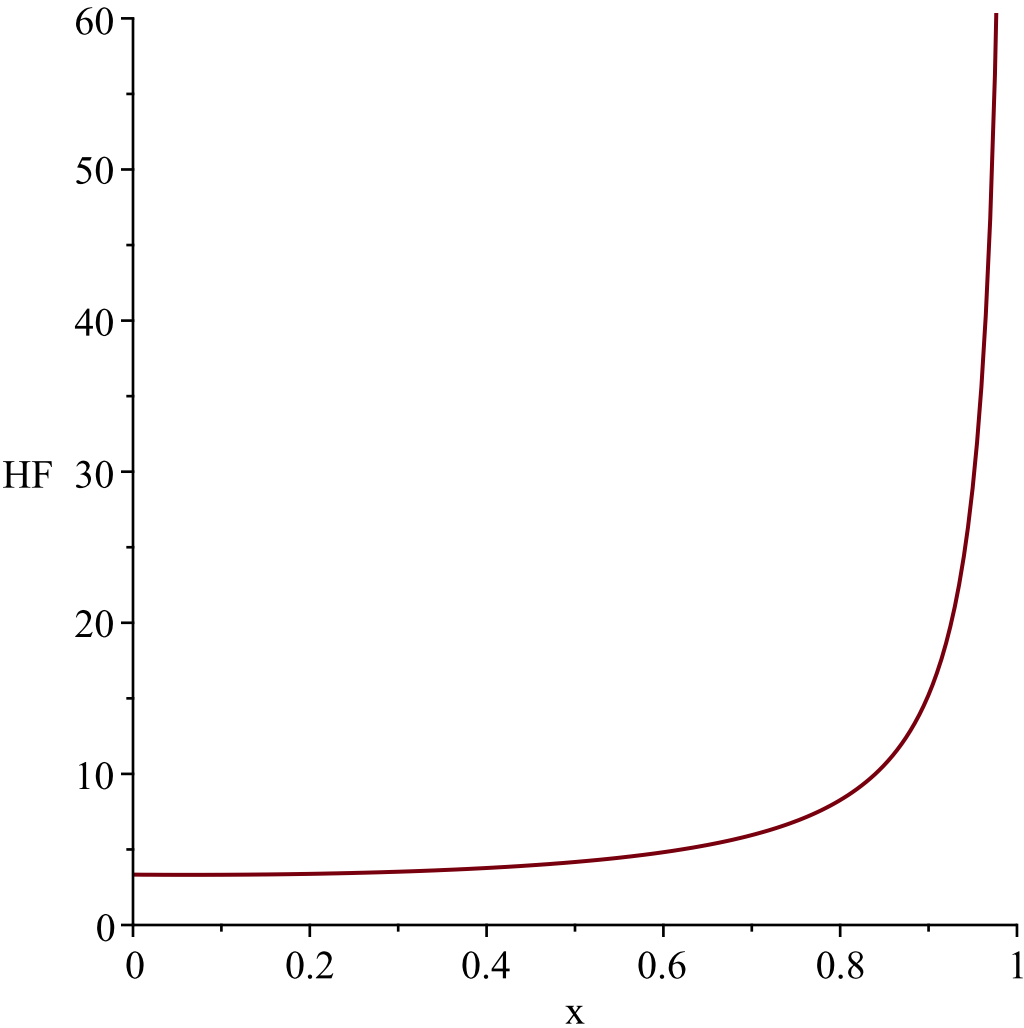


"i is", 11,
"-----"
-----"

```
g := t→tanh(t)
l := 0
u := ∞
Temp := ⌈⌊y~→162 (arctanh(y~) + 5)
(arctanh(y~) + 3)^5 (y~ + 1)^2⌋, [0, 1], ["Continuous", "PDF"]⌋
WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random
variable, 1
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, 1
Resetting high to RV's maximum support value*

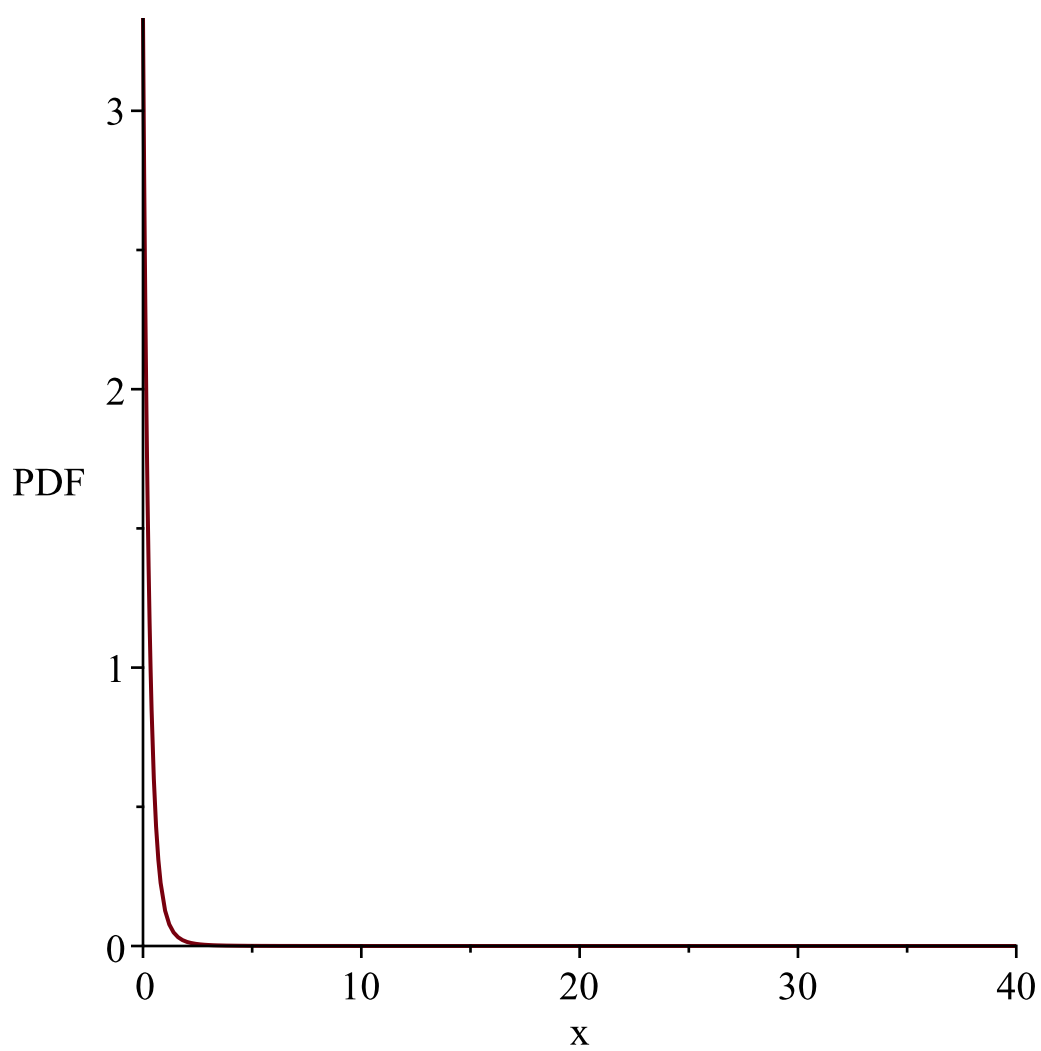


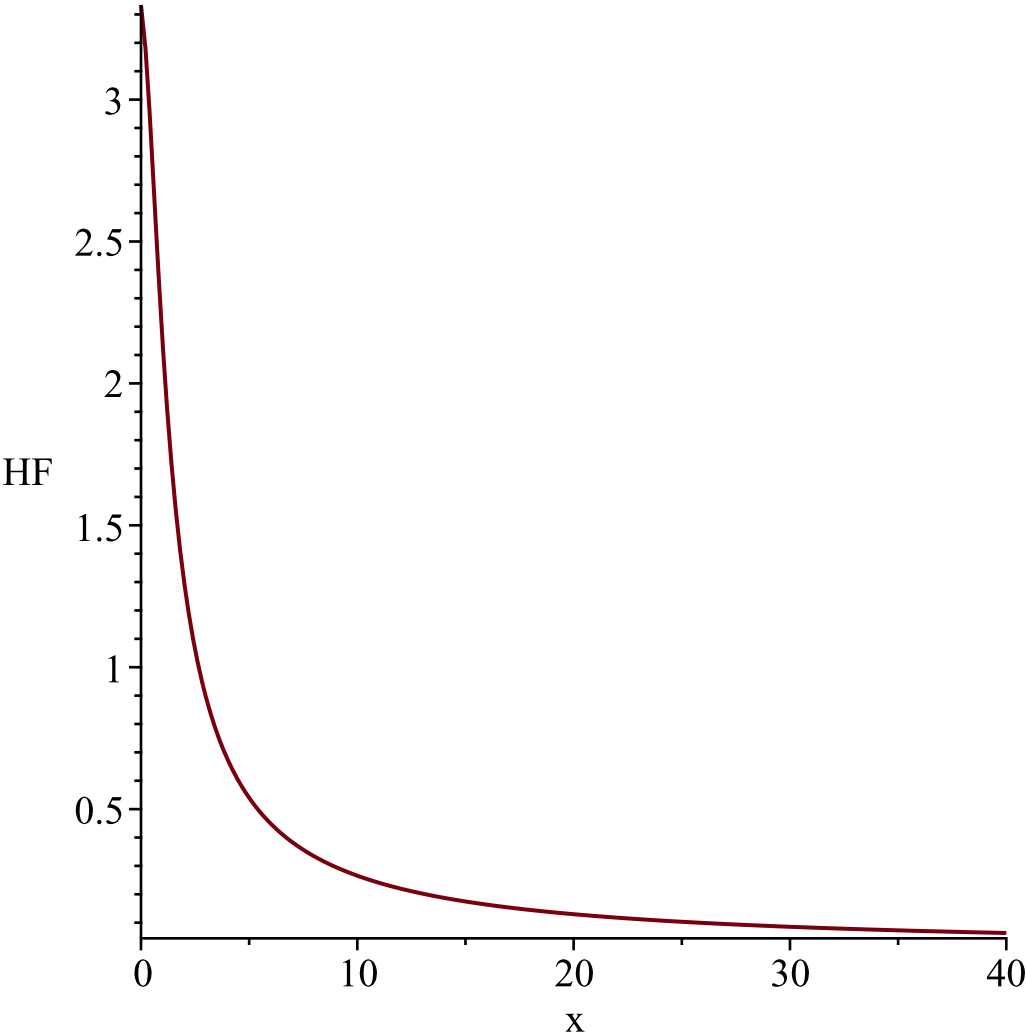
"i is", 12,
"-----"
-----"

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

$$Temp := \left[\left[y \rightsquigarrow \frac{162 \left(\operatorname{arcsinh}(y \rightsquigarrow) + 5 \right)}{\left(\operatorname{arcsinh}(y \rightsquigarrow) + 3 \right)^5 \left(y \rightsquigarrow + \sqrt{y \rightsquigarrow^2 + 1} \right)^2 \sqrt{y \rightsquigarrow^2 + 1}} \right], [0, \infty], ["Continuous",$$

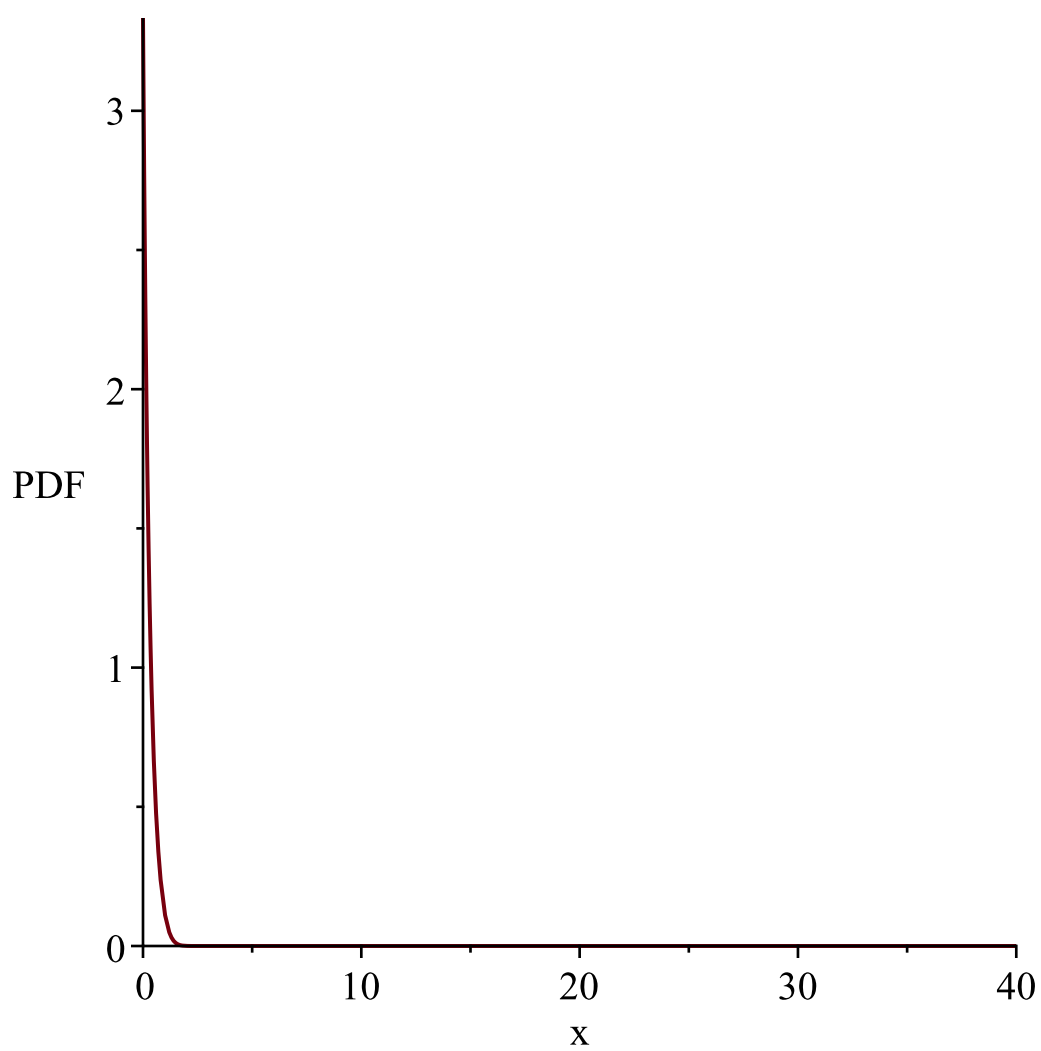
"PDF"]

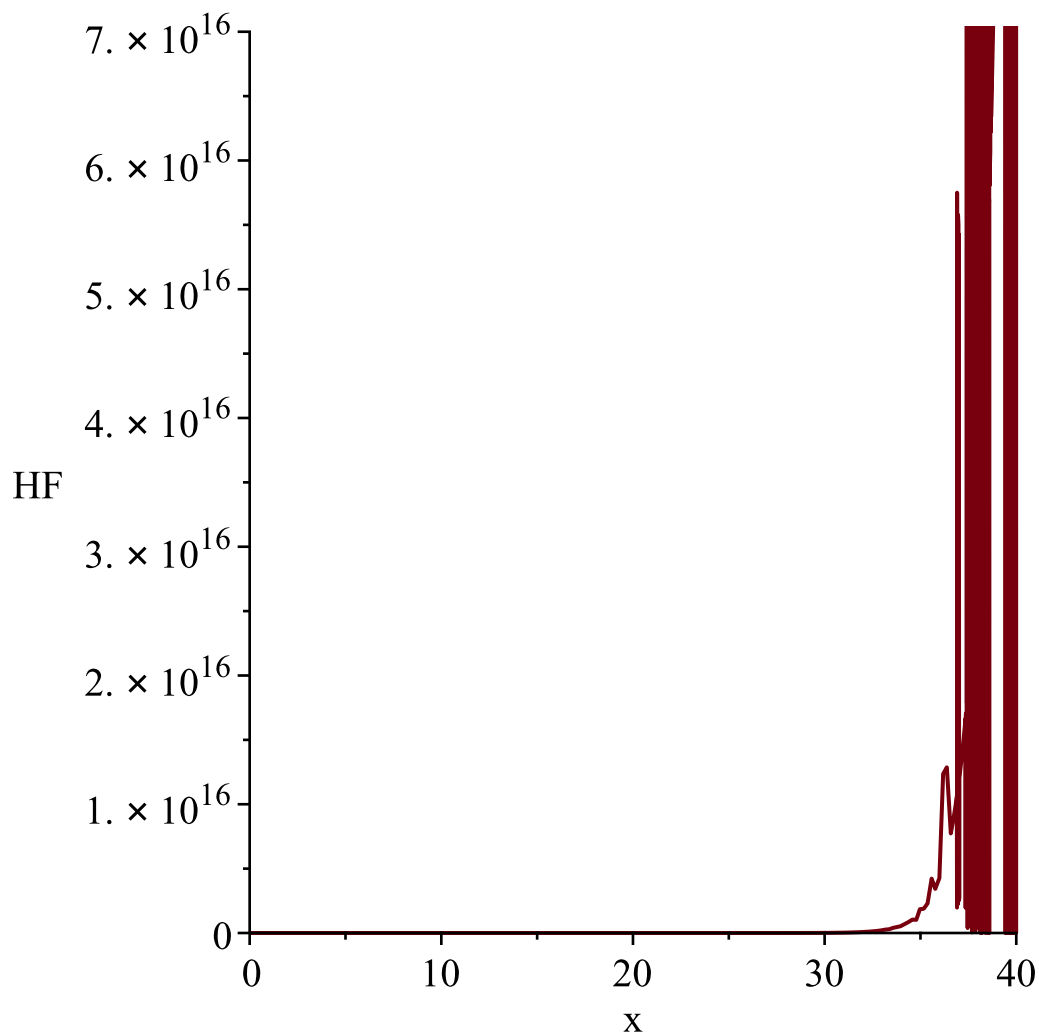




"i is", 13,
"-----"
-----"

$$\begin{aligned} g &:= t \rightarrow \operatorname{arcsinh}(t) \\ l &:= 0 \\ u &:= \infty \\ Temp &:= \left[\left[y \rightarrow \left(162 \left(\sinh(y) + 5 \right) e^{-2 \sinh(y)} \cosh(y) \right) / \left(\cosh(y)^4 \sinh(y) \right. \right. \right. \\ &\quad \left. \left. + 15 \cosh(y)^4 + 88 \cosh(y)^2 \sinh(y) + 240 \cosh(y)^2 + 316 \sinh(y) - 12 \right) \right], [0, \\ &\quad \infty], ["Continuous", "PDF"] \end{aligned}$$





"i is", 14,

"-----"

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

$$l := 0$$

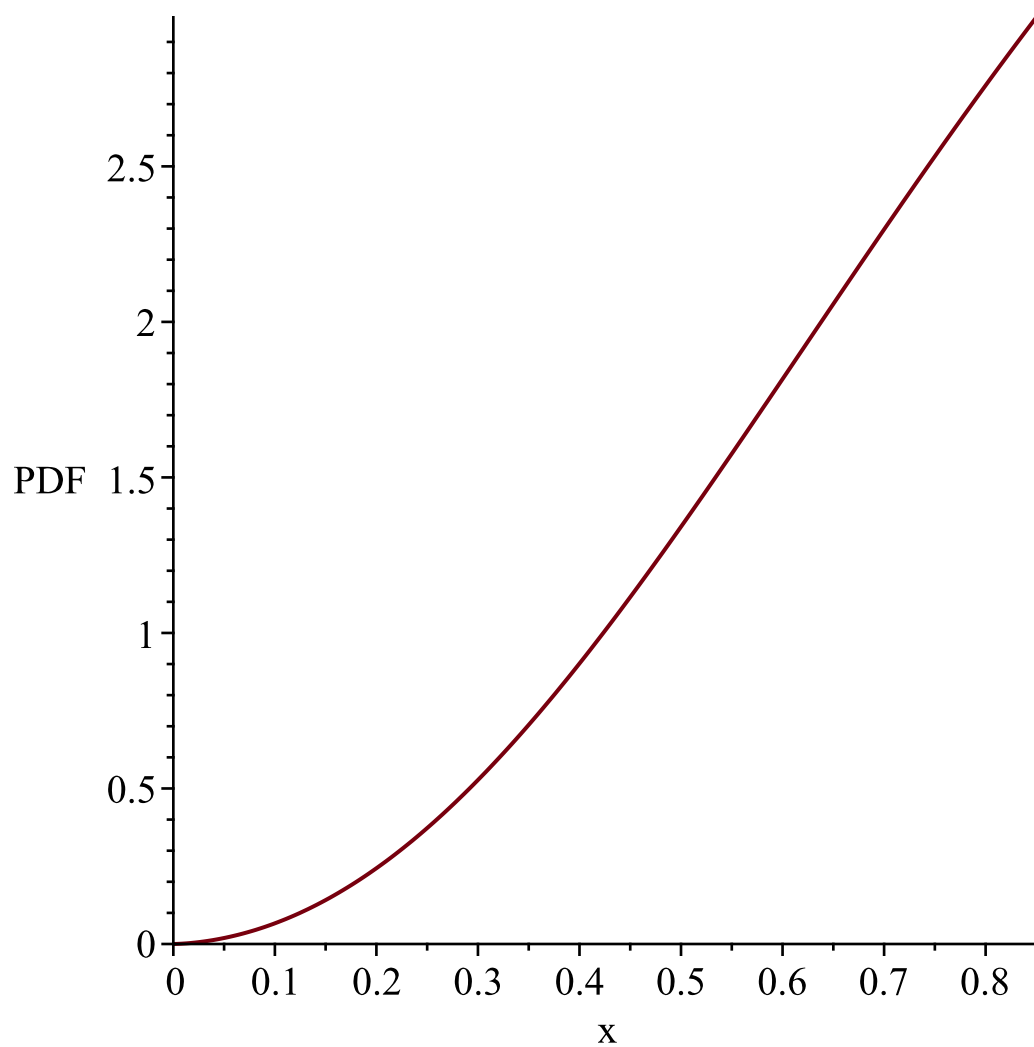
$$u := \infty$$

$$Temp := \left[\left[y \rightarrow \frac{162 (4 + \text{arccsch}(y)) e^{2 - 2 \text{arccsch}(y)}}{(2 + \text{arccsch}(y))^5 \sqrt{y^2 + 1} |y|} \right], \left[0, \frac{2}{e - e^{-1}} \right], ["Continuous", "PDF"] \right]$$

WARNING(PlotDist): High value provided by user, 40 is greater than maximum support value of the random

$$\text{variable, } \frac{2}{e - e^{-1}}$$

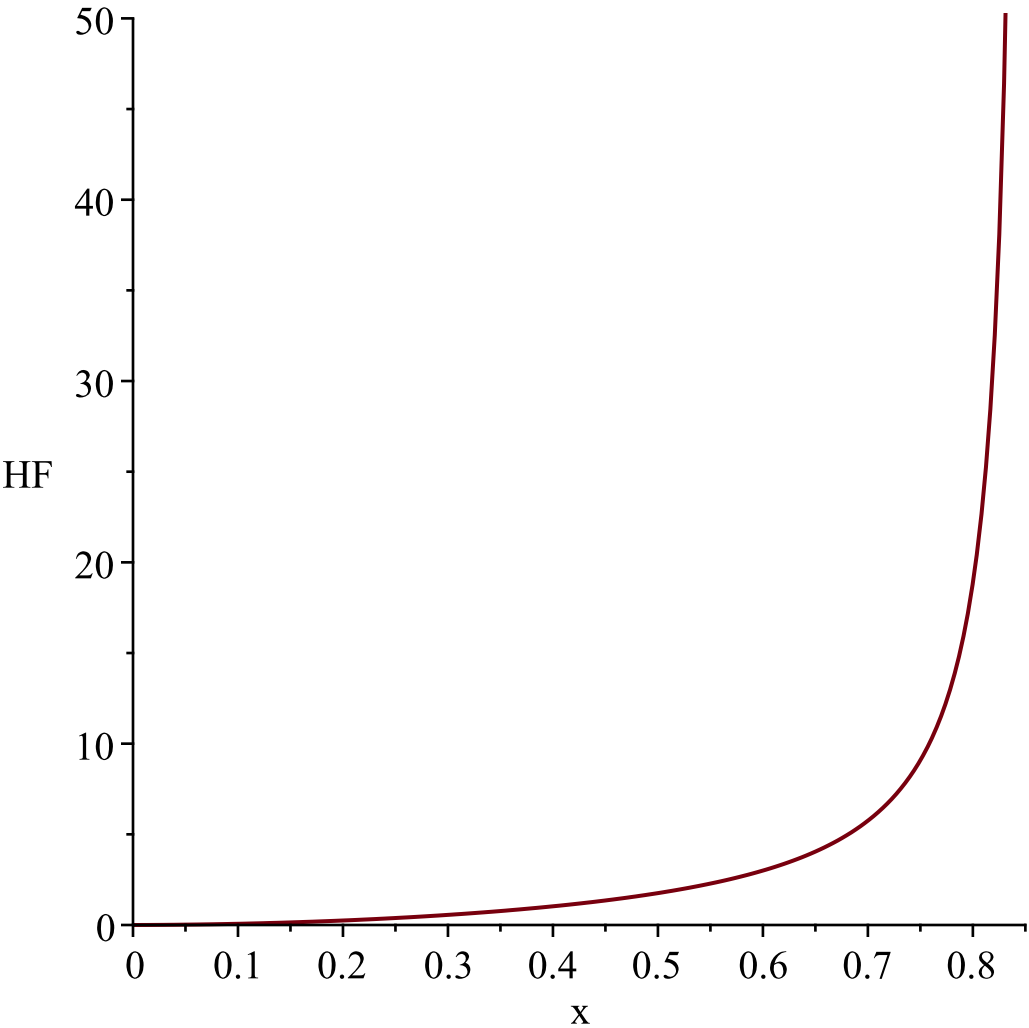
Resetting high to RV's maximum support value



*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random*

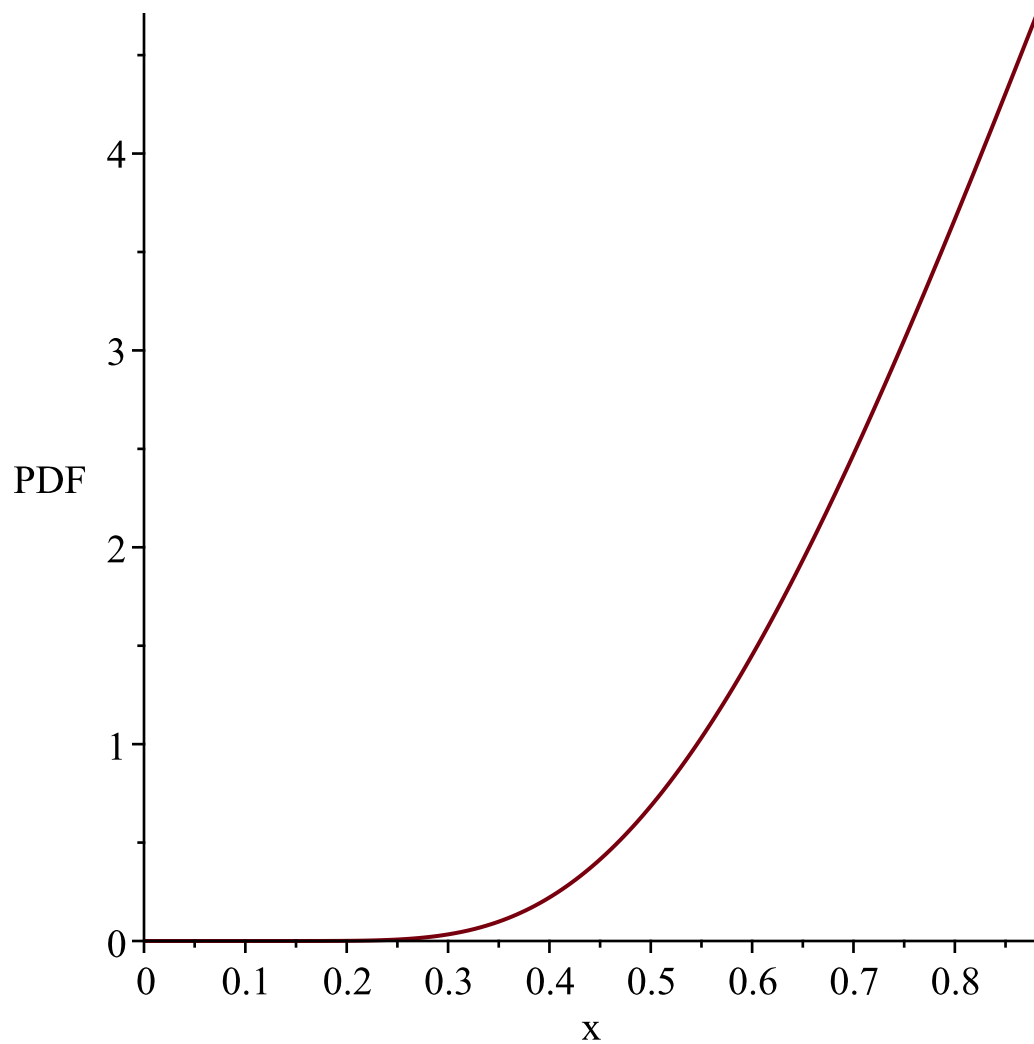
$$\text{variable, } \frac{2}{e - e^{-1}}$$

Resetting high to RV's maximum support value

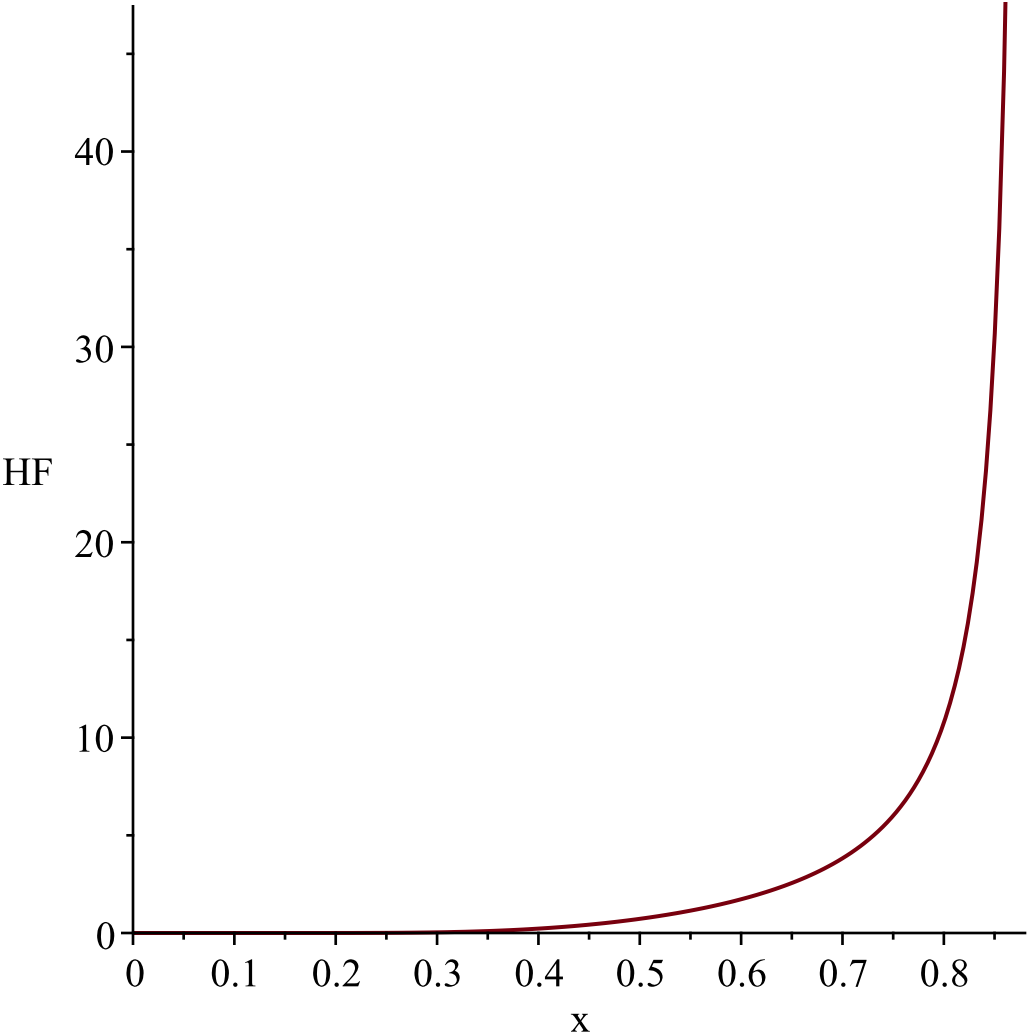


"i is", 15,
"-----"
-----"

```
g := t→arccsch(t + 1)
l := 0
u := ∞
Temp := [[y~→(162 (4 sinh(y~) + 1) e $\frac{2 (\sinh(y\sim) - 1)}{\sinh(y\sim)}$  cosh(y~) sinh(y~)2)/
(32 cosh(y~)4 sinh(y~) + 80 cosh(y~)4 + 16 cosh(y~)2 sinh(y~) - 120 cosh(y~)2
- 38 sinh(y~) + 41)], [0, ln(1 + √2)], ["Continuous", "PDF"]]
WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random
variable, ln(1 + √2)
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, $\ln(1 + \sqrt{2})$
Resetting high to RV's maximum support value*



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

$$g := t \rightarrow \frac{1}{\tanh(t + 1)}$$
$$l := 0$$
$$u := \infty$$
$$Temp := \left[\left[y \sim \rightarrow \frac{162 \left(4 + \operatorname{arctanh} \left(\frac{1}{y \sim} \right) \right)^2 e^{-2 \operatorname{arctanh} \left(\frac{1}{y \sim} \right)}}{\left(2 + \operatorname{arctanh} \left(\frac{1}{y \sim} \right) \right)^5 (y \sim^2 - 1)} \right], \left[1, \frac{e + e^{-1}}{e - e^{-1}} \right], ["Continuous",$$
$$"PDF"] \right]$$

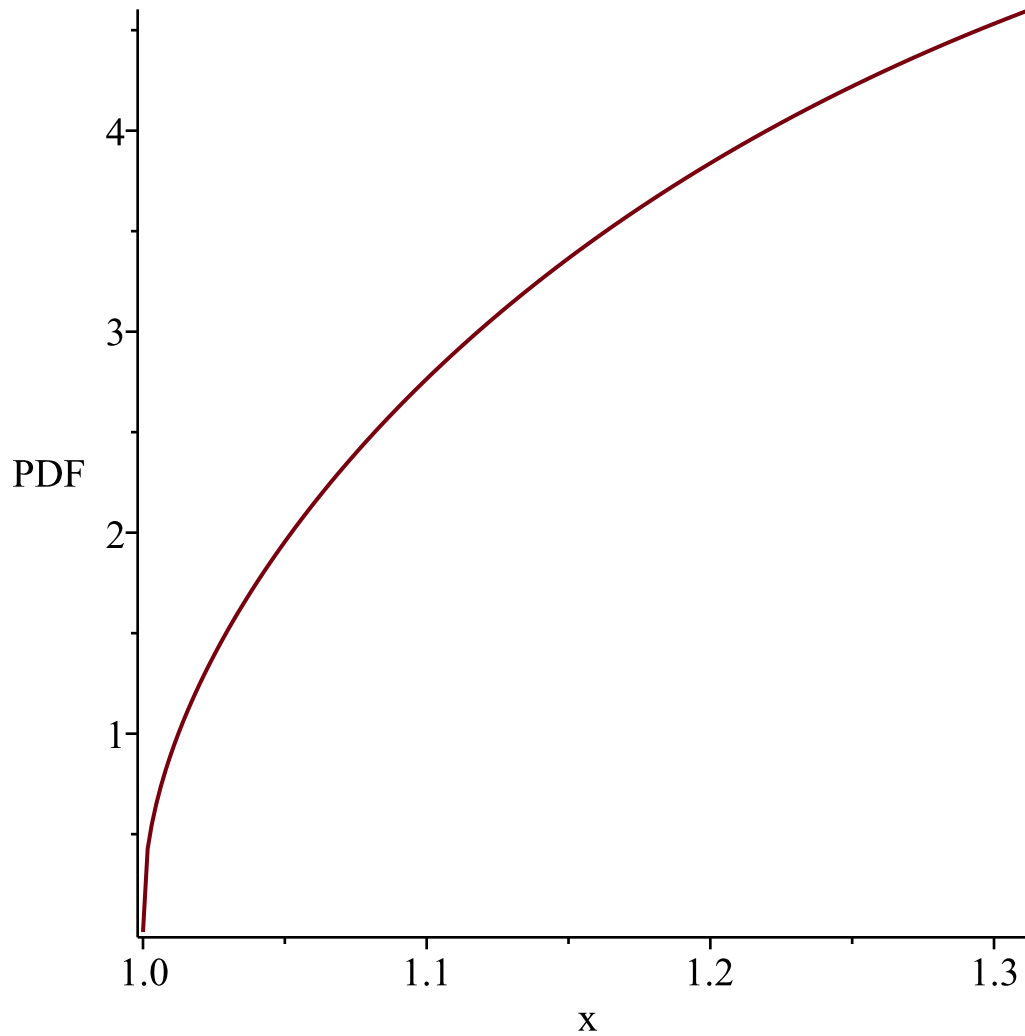
*WARNING(PlotDist): Low value provided by user, 0
is less than minimum support value of random variable*

1

Resetting low to RV's minimum support value
WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random

variable, $\frac{e+e^{-1}}{e-e^{-1}}$

Resetting high to RV's maximum support value



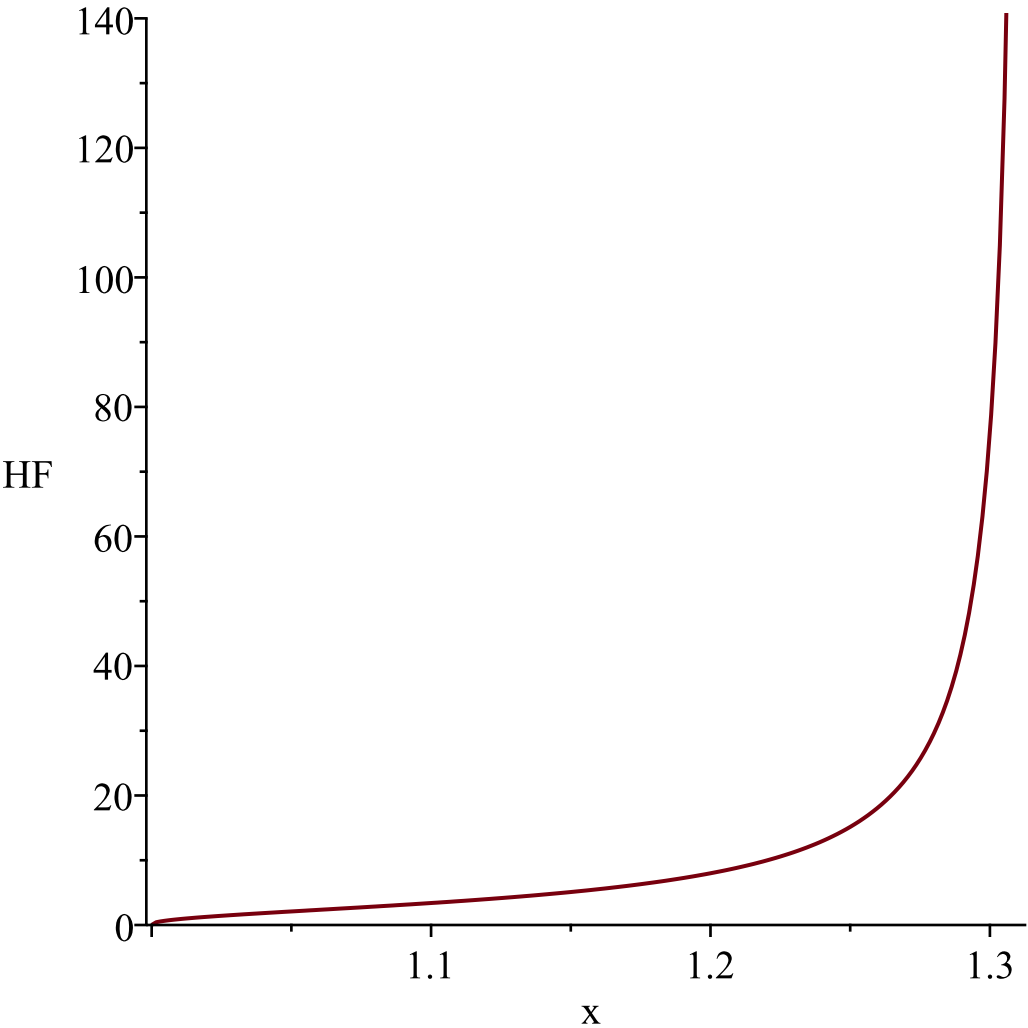
WARNING(PlotDist): Low value provided by user, 0
is less than minimum support value of random variable

1

Resetting low to RV's minimum support value
WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random

variable, $\frac{e+e^{-1}}{e-e^{-1}}$

Resetting high to RV's maximum support value



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

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

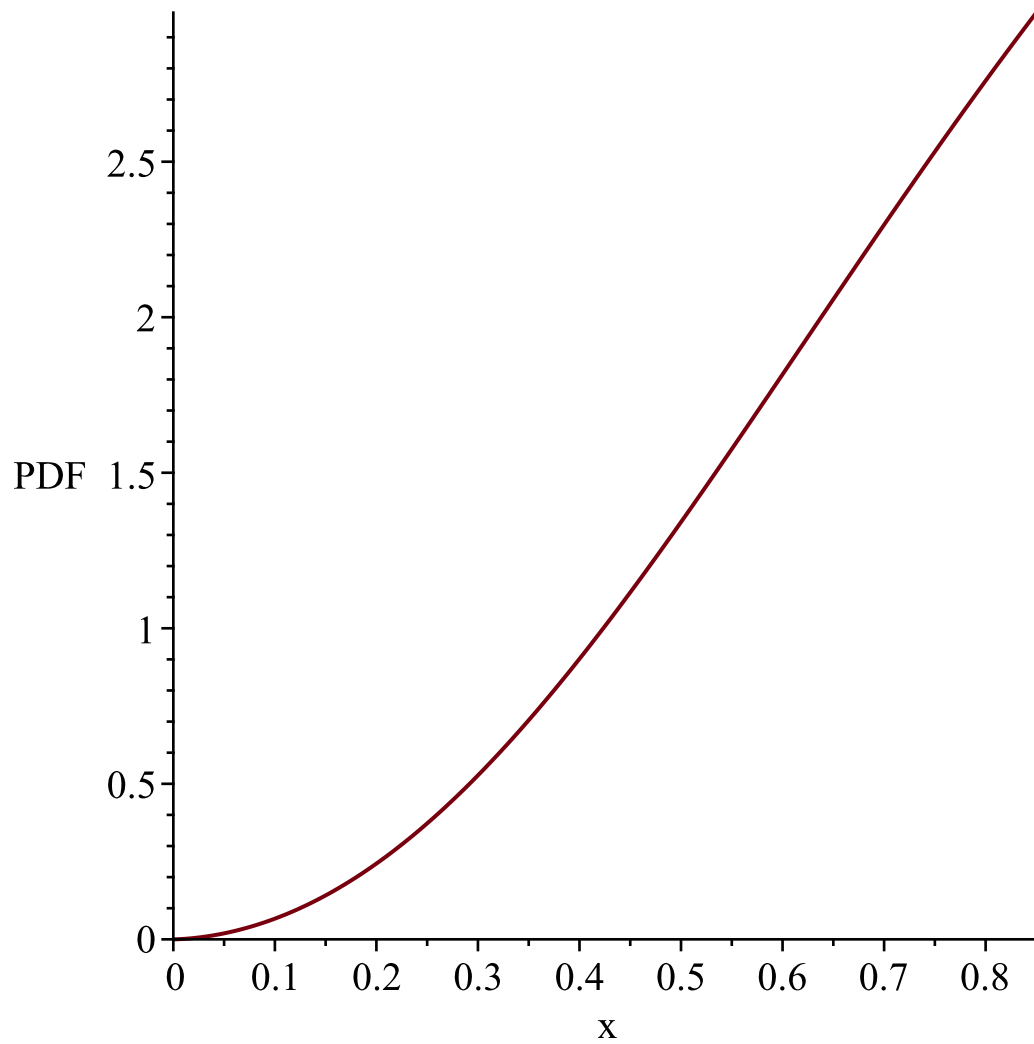
$$Temp := \left[\left[y \rightsquigarrow \frac{162 \left(4 + \operatorname{arcsinh} \left(\frac{1}{y \sim} \right) \right)^2 e^{-2 \operatorname{arcsinh} \left(\frac{1}{y \sim} \right)}}{\left(2 + \operatorname{arcsinh} \left(\frac{1}{y \sim} \right) \right)^5 \sqrt{y \sim^2 + 1} \, |y \sim|} \right], \left[0, \frac{2}{e - e^{-1}} \right], ["Continuous",$$

"PDF"]

*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random*

variable, $\frac{2}{e - e^{-1}}$

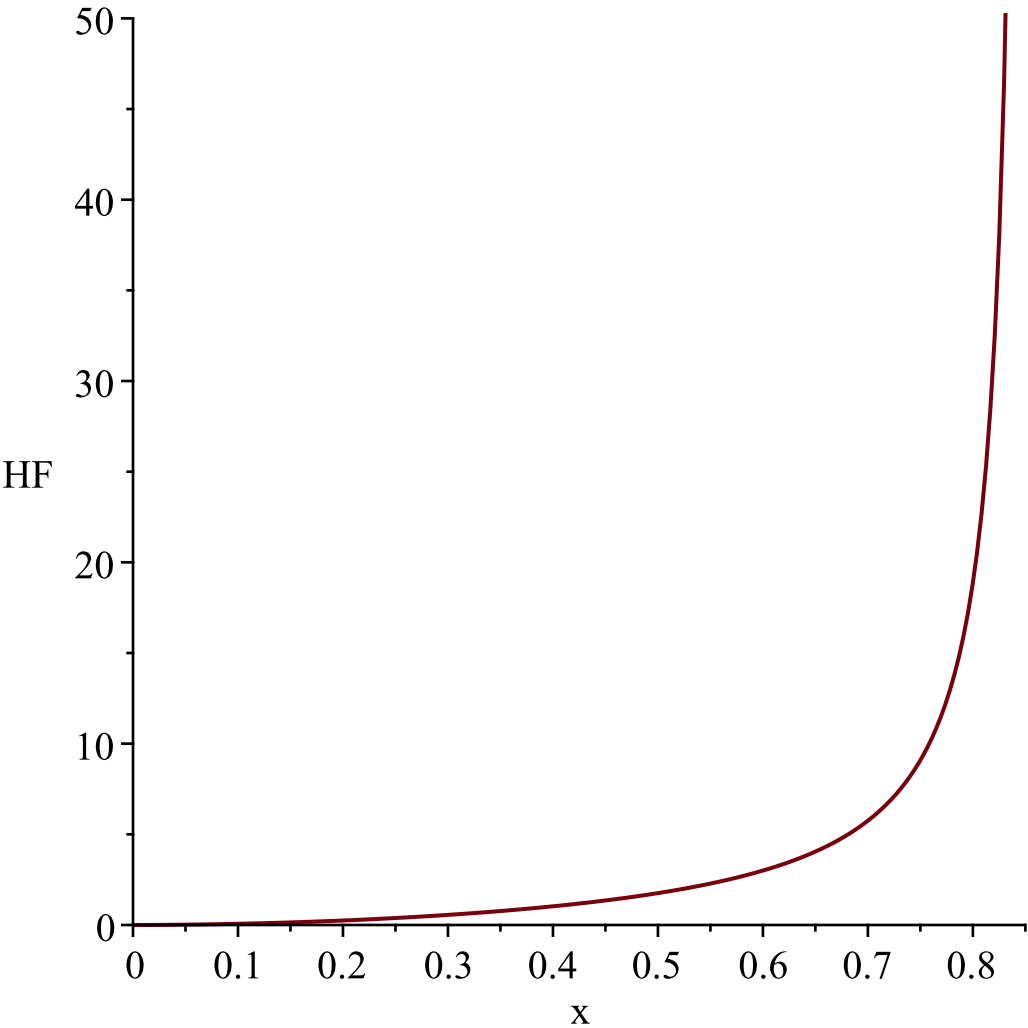
Resetting high to RV's maximum support value



*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random*

variable, $\frac{2}{e - e^{-1}}$

Resetting high to RV's maximum support value

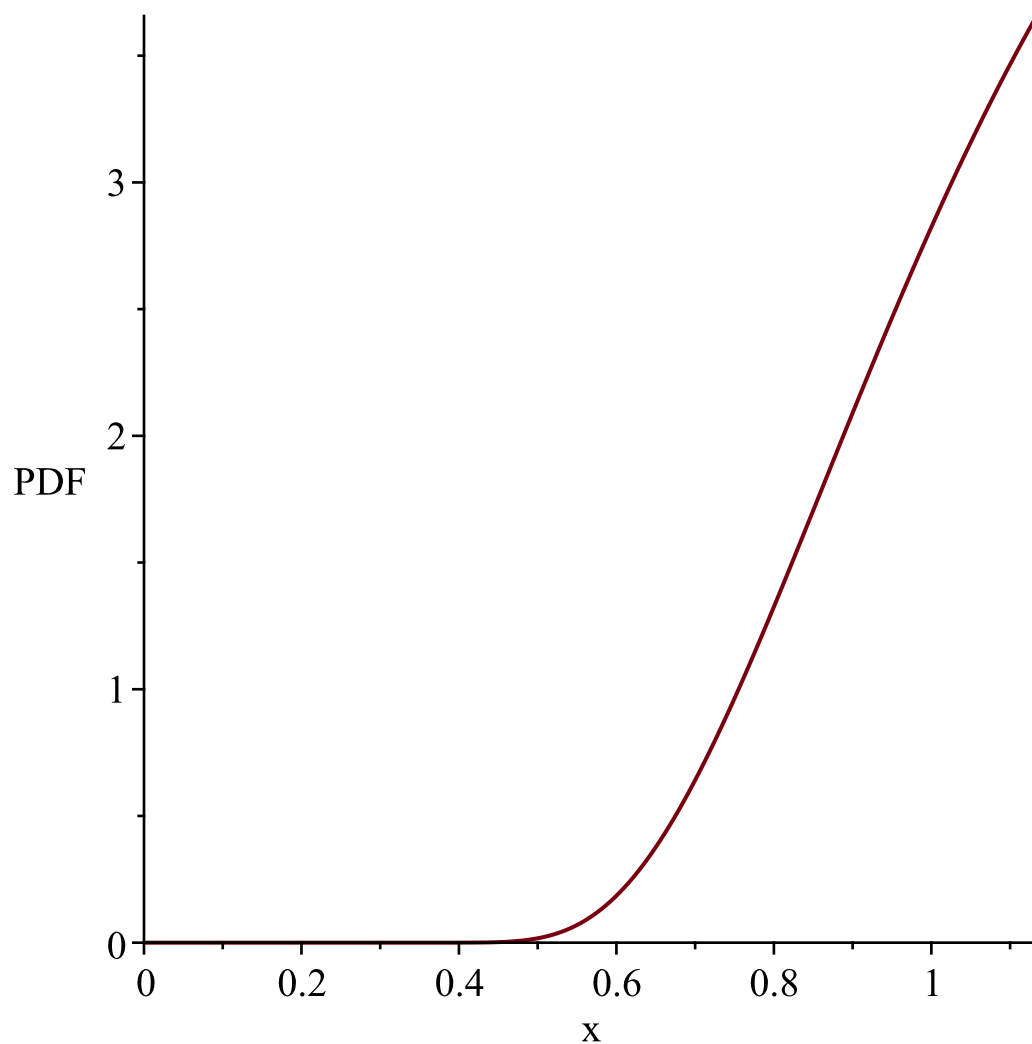


"i is", 18,
"-----"
"-----"

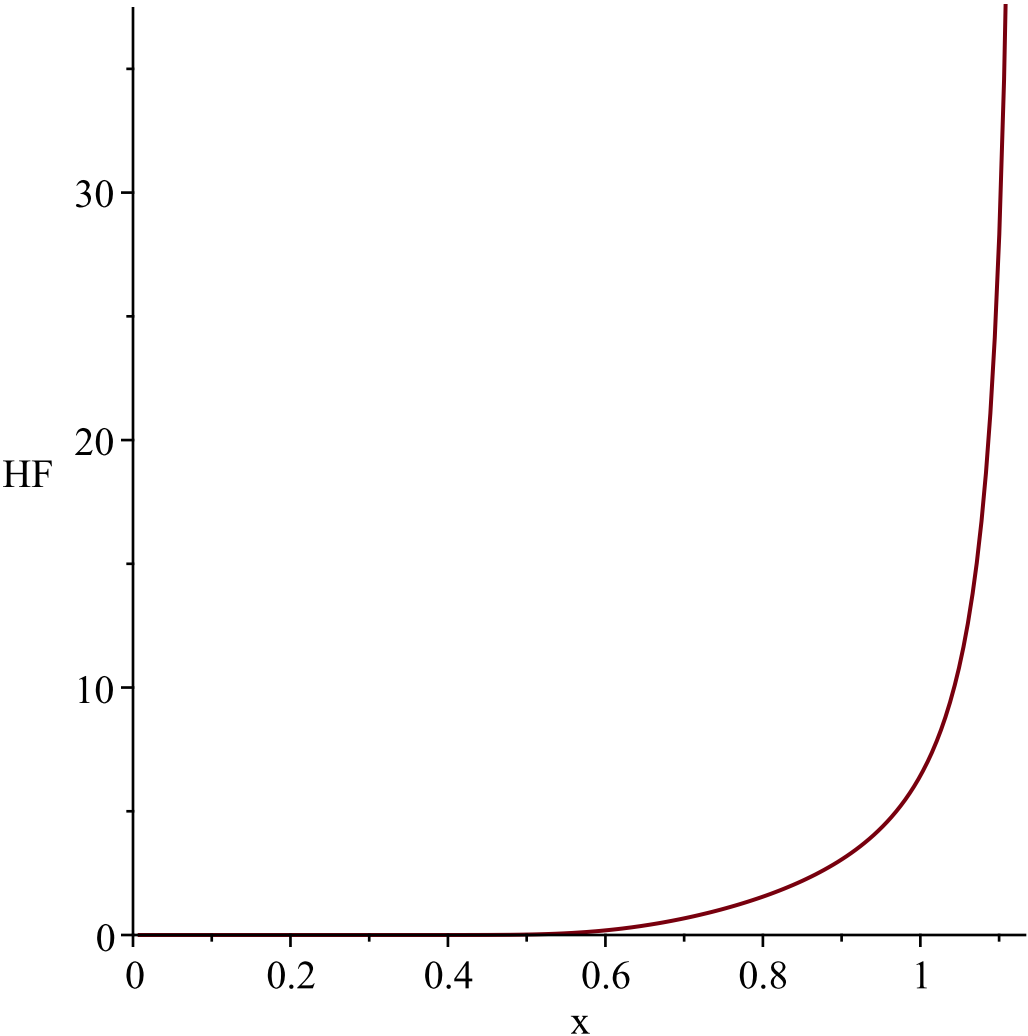
$$g := t \rightarrow \frac{1}{\operatorname{arcsinh}(t + 1)}$$
$$l := 0$$
$$u := \infty$$

$$Temp := \left[\left[y_{\sim} \rightarrow \left(162 \left(4 + \sinh \left(\frac{1}{y_{\sim}} \right) \right) e^{2 - 2 \sinh \left(\frac{1}{y_{\sim}} \right)} \cosh \left(\frac{1}{y_{\sim}} \right) \right) / \right. \right. \\ \left. \left(y_{\sim}^2 \left(\cosh \left(\frac{1}{y_{\sim}} \right)^4 \sinh \left(\frac{1}{y_{\sim}} \right) + 10 \cosh \left(\frac{1}{y_{\sim}} \right)^4 + 38 \cosh \left(\frac{1}{y_{\sim}} \right)^2 \sinh \left(\frac{1}{y_{\sim}} \right) \right. \right. \right. \right. \\ \left. \left. \left. + 60 \cosh \left(\frac{1}{y_{\sim}} \right)^2 + 41 \sinh \left(\frac{1}{y_{\sim}} \right) - 38 \right) \right] \right], \left[0, \frac{1}{\ln(1 + \sqrt{2})} \right], ["Continuous", \\ "PDF"] \right]$$

*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, 40
is greater than maximum support value of the random
variable, $\frac{1}{\ln(1 + \sqrt{2})}$
Resetting high to RV's maximum support value*



"i is", 19,
 "-----"
 "-----"

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

$$l:=0$$

$$u:=\infty$$

$$Temp:=\left[\left[y_{\sim}\right.\right.$$

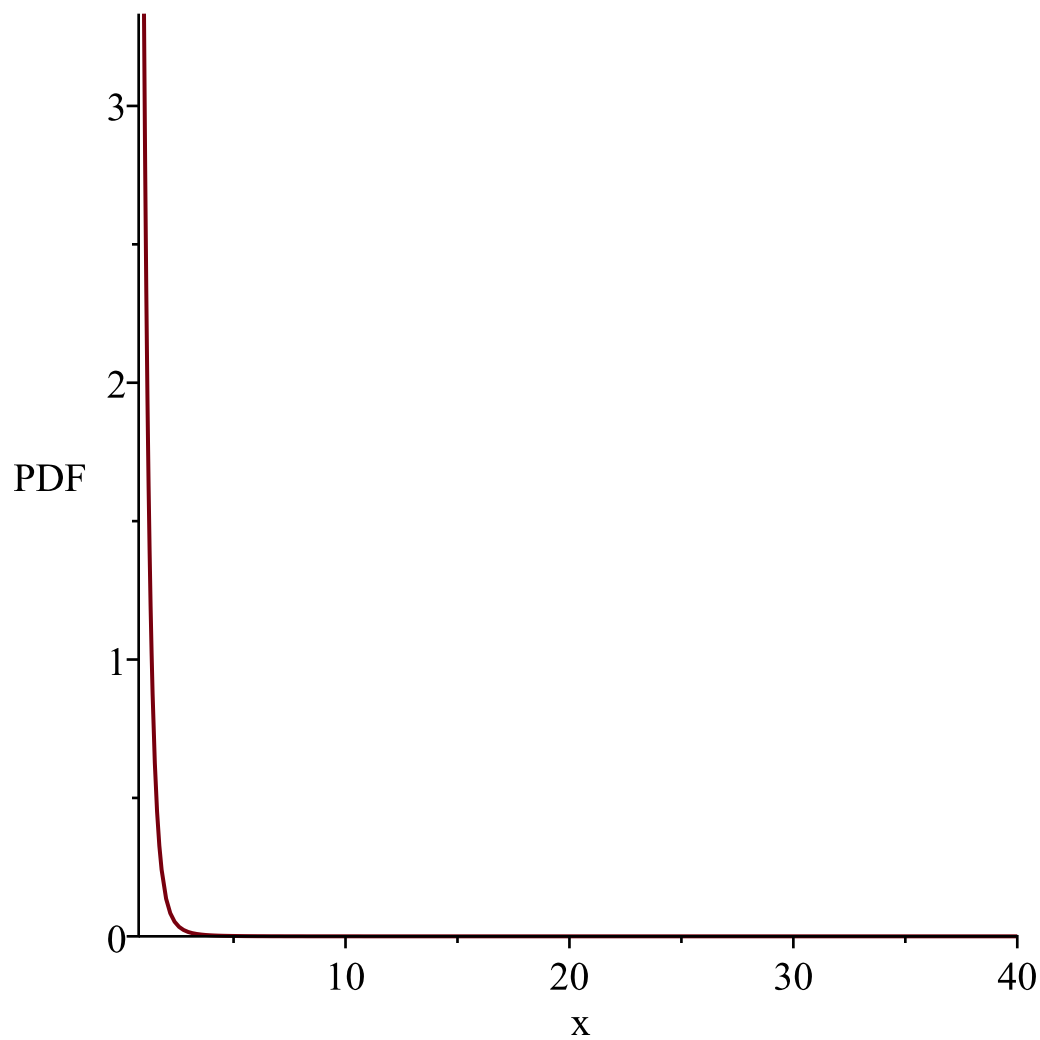
$$\rightarrow \frac{162\left(\operatorname{arccsch}\left(\frac{1}{y_{\sim}-1}\right)+5\right)}{\left(\operatorname{arccsch}\left(\frac{1}{y_{\sim}-1}\right)+3\right)^5\sqrt{y_{\sim}^2-2\,y_{\sim}+2}\left(y_{\sim}-1+\sqrt{y_{\sim}^2-2\,y_{\sim}+2}\right)^2},[1,$$

∞], ["Continuous", "PDF"]

*WARNING(PlotDist): Low value provided by user, 0
is less than minimum support value of random variable*

1

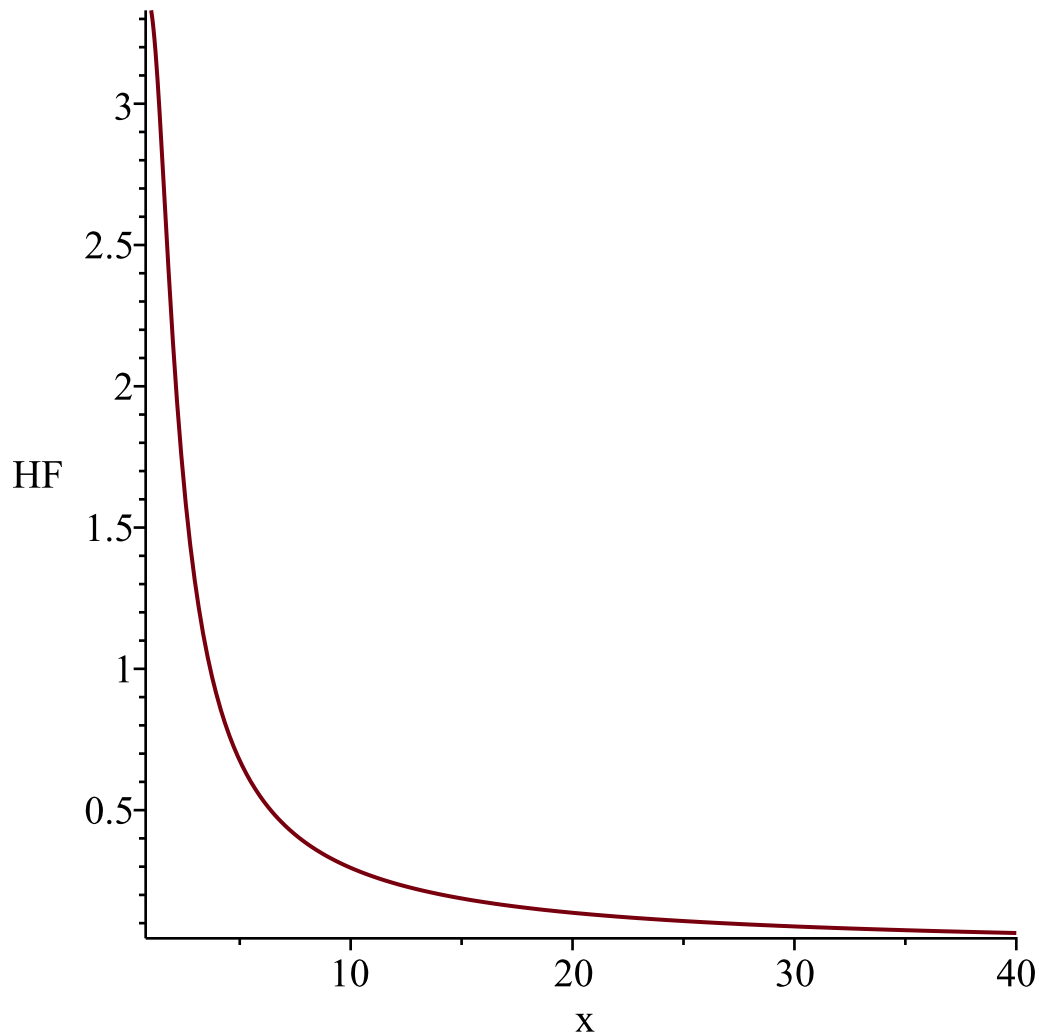
Resetting low to RV's minimum support value



*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



"i is", 20,

"-----"

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

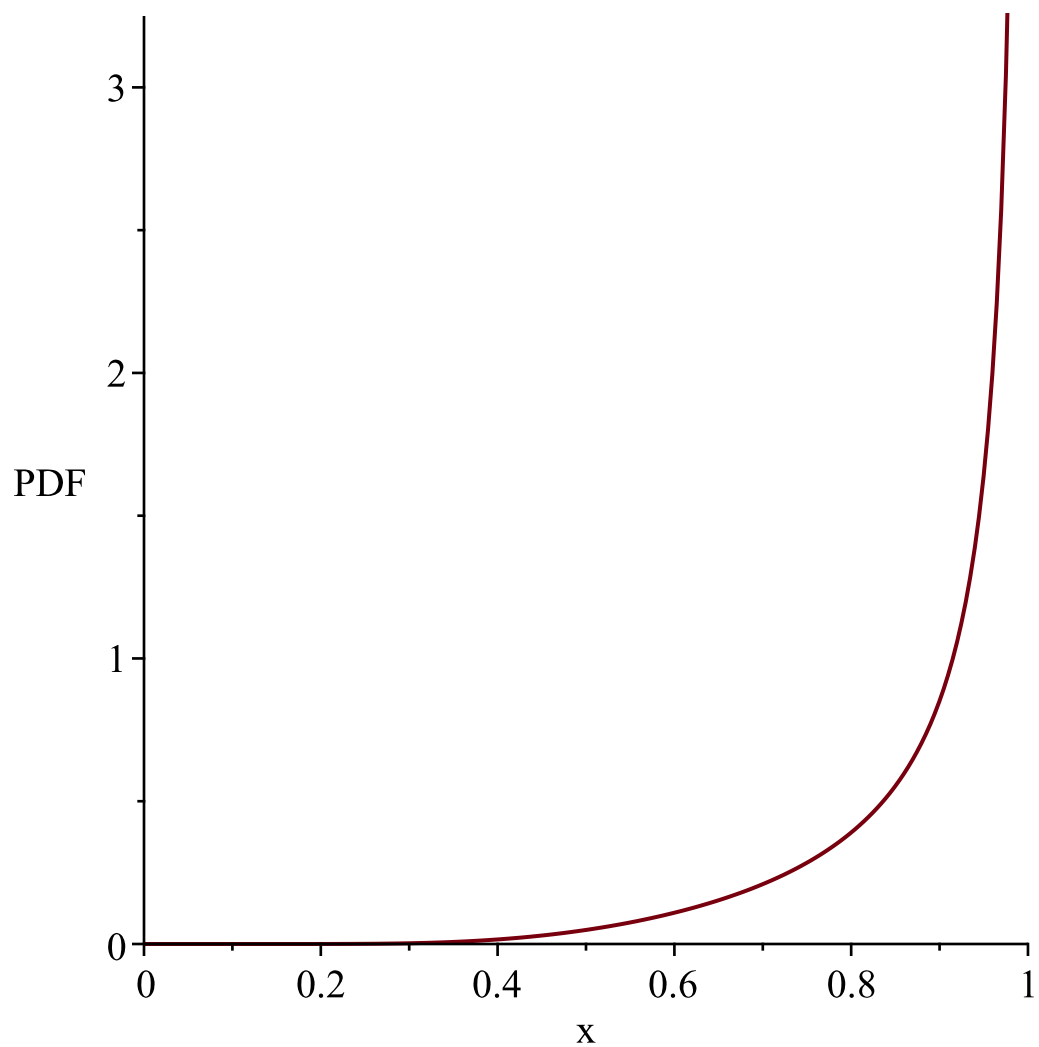
$$l := 0$$

$$u := \infty$$

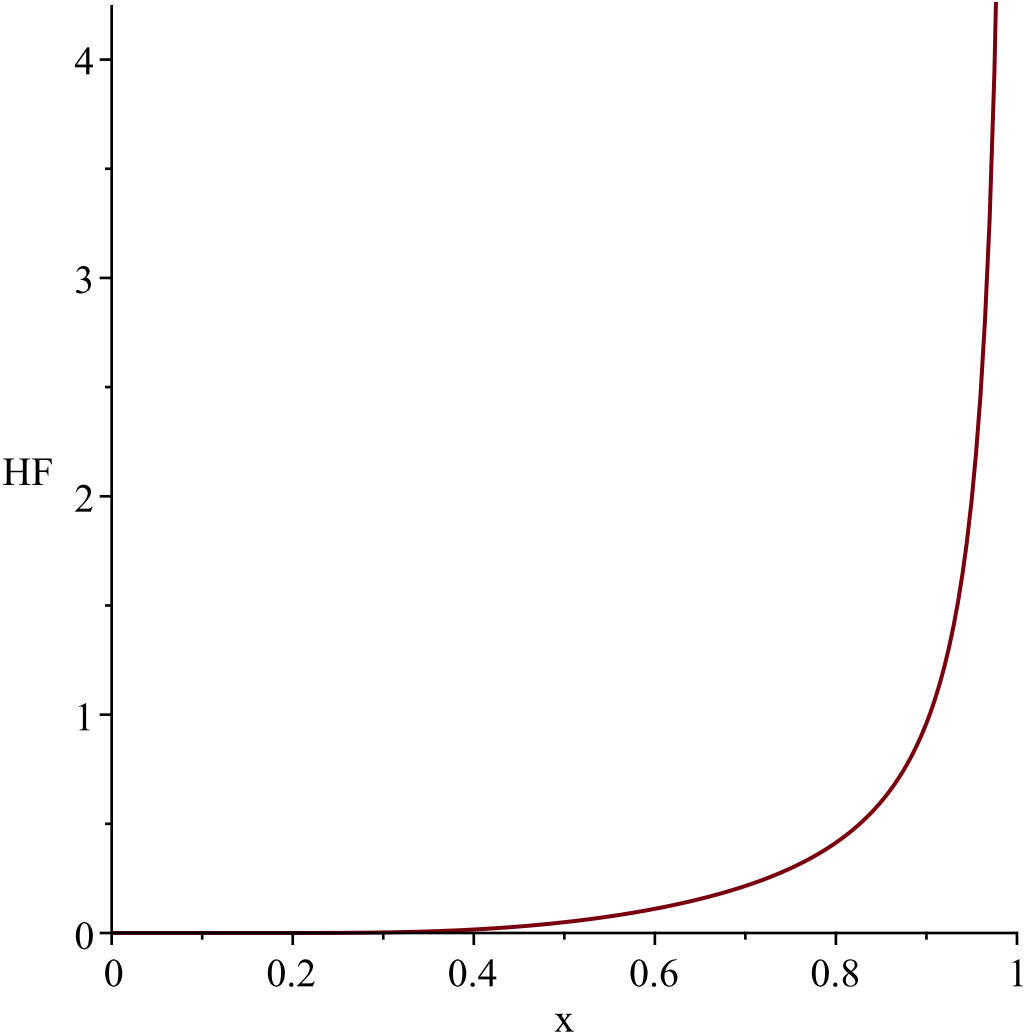
$$Temp := \left[\left[y \rightarrow -\frac{162 (1 + 5 \operatorname{arctanh}(y)) \operatorname{arctanh}(y)^2 e^{-\frac{2}{\operatorname{arctanh}(y)}}}{(1 + 3 \operatorname{arctanh}(y))^5 (y^2 - 1)} \right], [0, 1], \right. \\ \left. ["Continuous", "PDF"] \right]$$

*WARNING(PlotDist): High value provided by user, 40
is greater than maximum support value of the random
variable, 1*

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, 1
Resetting high to RV's maximum support value*

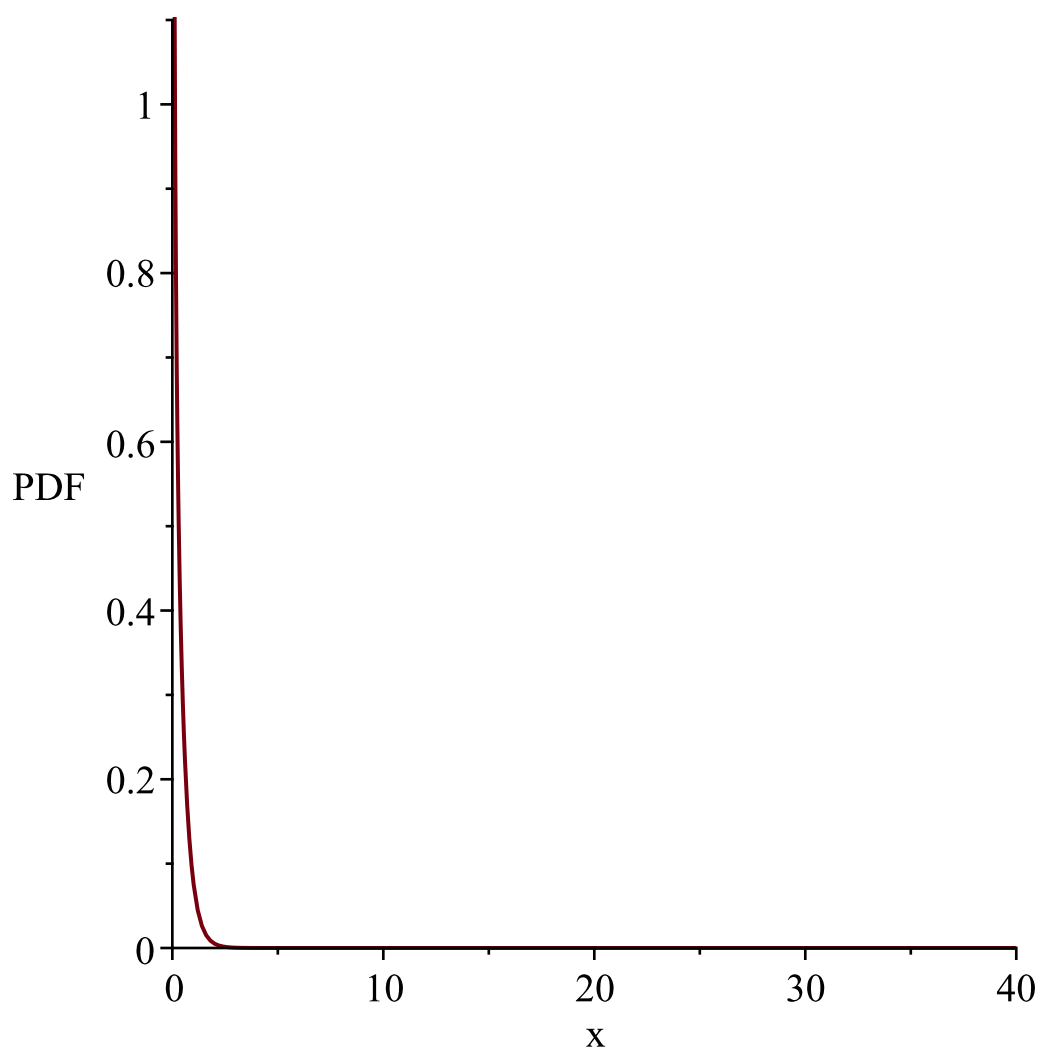


"i is", 21,
"-----"
-----"

$$g := t \rightarrow \operatorname{csch}\left(\frac{1}{t}\right)$$
$$l := 0$$
$$u := \infty$$

$$Temp := \left[\left[y \sim \rightarrow \frac{162 \, (1 + 5 \operatorname{arccsch}(y \sim)) \, e^{-\frac{2}{\operatorname{arccsch}(y \sim)}} \operatorname{arccsch}(y \sim)^2}{(1 + 3 \operatorname{arccsch}(y \sim))^5 \sqrt{y \sim^2 + 1} \, |y \sim|} \right], [0, \infty], \right.$$

$$[\text{"Continuous"}, \text{"PDF"}]$$



Warning, computation interrupted