Package ‘powdist’

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Type Package

Title Power and Reversal Power Distributions

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Imports stats, rmutil, gamlss.dist, normalp

Depends R (>= 3.1.0)

Description Density, distribution function, quantile function and random generation for the family of power and reversal power distributions.

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`powdist-package` *Power and reversal power distributions*

Description

The **powdist** package enables to compute the probability density function, cumulative distribution function, quantile function and generate random numbers for the following distributions: power Logistic (plogis), reversal power Logistic (rplogis), power Normal (pnorm), reversal power Normal (rpnorm), power Cauchy (pcauchy), reversal power Cauchy (rpcauchy), power reversal-Gumbel (prgumbel), power Student T (pt), reversal power Student T (rpt), power Laplace (plaplace), reversal power Laplace (rplaplace), power exponential power (pexpow) and reversal power exponential power (rpexpow).

`ExponentialPower` *The Exponential Power Distribution*

Description

Density, distribution function, quantile function and random generation for the exponential power distribution with parameters mu, sigma and k.

Usage

```
dexpow(x, mu = 0, sigma = 1, k = 0, log = FALSE)

pexpow(q, mu = 0, sigma = 1, k = 0, lower.tail = TRUE, log.p = FALSE)

qexpow(p, mu = 0, sigma = 1, k = 0, lower.tail = TRUE, log.p = FALSE)

rexpow(n, mu = 0, sigma = 1, k = 0)
```

Arguments

`x, q`	vector of quantiles.
`mu, sigma`	location and scale parameters.
`k`	shape parameter.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The Exponential distribution has density

$$f\left(x\right)=\left[\frac{e^{-\left(\frac{x-\mu}{\sigma}\right)}}{\left(1+e^{-\left(\frac{x-\mu}{\sigma}\right)}\right)^{2}}\right],$$

where $-\infty < \mu < \infty$ is the location parameter, $\sigma^2 > 0$ the scale parameter and k the shape parameter.

References

Lemonte A. and Bazán J.L.

Examples

```
dexpow(1, 3, 4, 1)
pexpow(1, 3, 4, 1)
qexpow(0.2, 3, 4, 1)
rexpow(5, 3, 4, 1)
```

`Gumbel` *The Gumbel Distribution*

Description

Density, distribution function, quantile function and random generation for the Gumbel distribution with parameters mu and sigma.

Usage

```
dgumbel(x, mu = 0, sigma = 1, log = FALSE)

pgumbel(q, mu = 0, sigma = 1, lower.tail = TRUE, log.p = FALSE)

qgumbel(p, mu = 0, sigma = 1, lower.tail = TRUE, log.p = FALSE)

rgumbel(n, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \le x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The Gumbel distribution has density

$$f(x) = \left[\frac{1}{\sigma} e^{\left(-\frac{x-\mu}{\sigma}\right) - e^{\left(-\frac{x-\mu}{\sigma}\right)}}\right],$$

where $-\infty < \mu < \infty$ is the location paramether and $\sigma^2 > 0$ is the scale parameter.

Examples

```
dgumbel(1, 3, 4)
pgumbel(1, 3, 4)
qgumbel(0.2, 3, 4)
rgumbel(5, 3, 4)
```

`PowerCauchy` *The Power Cauchy Distribution*

Description

Density, distribution function, quantile function and random generation for the power Cauchy distribution with parameters mu, sigma and lambda.

Usage

```
dpcauchy(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

ppcauchy(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qpcauchy(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rpcauchy(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power Cauchy distribution has density

$$f(x) = \lambda \left[\frac{1}{\pi} \arctan\left(\frac{x-\mu}{\sigma}\right) + \frac{1}{2} \right]^{\lambda-1} \left[\frac{1}{\pi\sigma\left(1+\left(\frac{x-\mu}{\sigma}\right)^2\right)} \right],$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Examples

```
dpcauchy(1, 1, 3, 4)
ppcauchy(1, 1, 3, 4)
qpcauchy(0.2, 1, 3, 4)
rpcauchy(5, 2, 3, 4)
```

`PowerExponentialPower` *The Power Exponential Power Distribution*

Description

Density, distribution function, quantile function and random generation for the power exponential power distribution with parameters mu, sigma, lambda and k.

Usage

```
dpexpow(x, lambda = 1, mu = 0, sigma = 1, k = 0, log = FALSE)

ppexpow(q, lambda = 1, mu = 0, sigma = 1, k = 0, lower.tail = TRUE,
  log.p = FALSE)

qpexpow(p, lambda = 1, mu = 0, sigma = 1, k = 0, lower.tail = TRUE,
  log.p = FALSE)

rpexpow(n, lambda = 1, mu = 0, sigma = 1, k = 0)
```

Arguments

`x, q`	vector of quantiles.
`mu, sigma`	location and scale parameters.
`k, lambda`	shape parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power exponential power distribution has density

$$f\left(x\right)=\frac{\lambda}{\sigma}\left[\frac{e^{-\left(\frac{x-\mu}{\sigma}\right)}}{\left(1+e^{-\left(\frac{x-\mu}{\sigma}\right)}\right)^{2}}\right]\left[\frac{e^{\left(\frac{x-\mu}{\sigma}\right)}}{1+e^{\left(\frac{x-\mu}{\sigma}\right)}}\right]^{\lambda-1},$$

where $-\infty<\mu<\infty$ is the location paramether, $\sigma^2>0$ the scale parameter and $\lambda>0$ and k the shape parameters.

References

Lemonte A. and Bazán J.L.

Examples

```
dpexpow(1, 1, 3, 4, 1)
ppexpow(1, 1, 3, 4, 1)
qpexpow(0.2, 1, 3, 4, 1)
rpexpow(5, 2, 3, 4, 1)
```

PowerLaplace *The Power Laplace Distribution*

Description

Density, distribution function, quantile function and random generation for the power Laplace distribution with parameters mu, sigma and lambda.

Usage

```
dplaplace(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

pplaplace(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qplaplace(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rplaplace(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power Laplace distribution has density

$f(x) = \lambda \left[\frac{1}{2} + \frac{\left(1 - e^{-\frac{|x-\mu|}{\sigma}}\right)}{2} \text{sign}\left(\frac{x-\mu}{\sigma}\right) \right]^{\lambda-1} \left[\frac{e^{-\frac{|x-\mu|}{\sigma}}}{2\sigma} \right]$, where $-\infty < \mu < \infty$ is the location parameter, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

Examples

```
dplaplace(1, 1, 3, 4)
pplaplace(1, 1, 3, 4)
qplaplace(0.2, 1, 3, 4)
rplaplace(5, 2, 3, 4)
```

`PowerLogistic` *The Power Logistic Distribution*

Description

Density, distribution function, quantile function and random generation for the power logistic distribution with parameters mu, sigma and lambda.

Usage

```
dplogis(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

pplogis(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qplogis(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rplogis(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power Logistic distribution has density

$f(x) = \lambda \left[\frac{1}{1+e^{-\left(\frac{x-\mu}{\sigma}\right)}} \right]^{\lambda-1} \left[\frac{e^{-\left(\frac{x-\mu}{\sigma}\right)}}{\sigma\left(1+e^{-\left(\frac{x-\mu}{\sigma}\right)}\right)^2} \right]$, where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 16. Wiley, New York.

Lemonte, A. J. and Bazán, J. L. (2017) New links for binary regression: an application to coca cultivation in Peru. *TEST*.

Nadarajah, S. (2009) The skew logistic distribution. *AStA Advances in Statistical Analysis*, **93**, 187-203.

Prentice, R. L. (1976) A Generalization of the probit and logit methods for dose-response curves. *Biometrika*, **32**, 761-768.

Examples

```
dplogis(1, 1, 3, 4)
pplogis(1, 1, 3, 4)
qplogis(0.2, 1, 3, 4)
rplogis(5, 2, 3, 4)
```

PowerNormal — *The Power Normal Distribution*

Description

Density, distribution function, quantile function and random generation for the power normal distribution with parameters mu, sigma and lambda.

Usage

```
dpnorm(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

ppnorm(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qpnorm(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rpnorm(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).

`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power Normal distribution has density

$$f(x) = \lambda \left[\Phi\left(\frac{x-\mu}{\sigma}\right)\right]^{\lambda-1} \left[\frac{e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}}{\sigma\sqrt{2\pi}}\right],$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Bazán, J. L., Romeo, J. S. and Rodrigues, J. (2014) Bayesian skew-probit regression for binary response data. *Brazilian Journal of Probability and Statistics*. **28**(4), 467–482.

Gupta, R. D. and Gupta, R. C. (2008) Analyzing skewed data by power normal model. *Test* **17**, 197–210.

Kundu, D. and Gupta, R. D. (2013) Power-normal distribution. *Statistics* **47**, 110–125.

Examples

```
dpnorm(1, 1, 3, 4)
ppnorm(1, 1, 3, 4)
qpnorm(0.2, 1, 3, 4)
rpnorm(5, 2, 3, 4)
```

`PowerReversalGumbel` *The Power Reversal-Gumbel Distribution*

Description

Density, distribution function, quantile function and random generation for the power Reversal-Gumbel distribution with parameters mu, sigma and lambda.

Usage

```
dprgumbel(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

pprgumbel(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qprgumbel(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rprgumbel(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power reverlsa-Gumbel distribution has density

$$f(x) = \lambda \left[1 - e^{-e^{\left(\frac{x-\mu}{\sigma}\right)}}\right]^{\lambda-1} \left[\frac{1}{\sigma} e^{\left(\frac{x-\mu}{\sigma}\right) - e^{\left(\frac{x-\mu}{\sigma}\right)}}\right],$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Abanto -Valle, C. A., Bazán, J. L. and Smith, A. C. (2014) *State space mixed models for binary responses with skewed inverse links using JAGS*. Rio de Janeiro, Brazil.

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Examples

```
dprgumbel(1, 1, 3, 4)
pprgumbel(1, 1, 3, 4)
qprgumbel(0.2, 1, 3, 4)
rprgumbel(5, 2, 3, 4)
```

PowerT *The Power Student t Distribution*

Description

Density, distribution function, quantile function and random generation for the power Student t distribution with parameters mu, sigma, lambda and df.

Usage

```
dpt(x, lambda = 1, mu = 0, sigma = 1, df, log = FALSE)

ppt(q, lambda = 1, mu = 0, sigma = 1, df, lower.tail = TRUE,
  log.p = FALSE)

qpt(p, lambda = 1, mu = 0, sigma = 1, df, lower.tail = TRUE,
  log.p = FALSE)

rpt(n, lambda = 1, mu = 0, sigma = 1, df)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`df`	degrees of freedom (> 0, maybe non-integer). df = Inf is allowed.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The power Student t distribution has density

$f(x) = [\lambda/\sigma][f((x-\mu)/\sigma)][F((x-\mu)/\sigma)]^(\lambda - 1),$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Lemonte A. and Bazán J.L.

Examples

```
dpt(1, 1, 3, 4, 1)
ppt(1, 1, 3, 4, 1)
qpt(0.2, 1, 3, 4, 1)
rpt(5, 2, 3, 4, 1)
```

ReversalGumbel *The Reversal-Gumbel Distribution*

Description

Density, distribution function, quantile function and random generation for the Reversal-Gumbel distribution with parameters mu and sigma.

Usage

```
drgumbel(x, mu = 0, sigma = 1, log = FALSE)

prgumbel(q, mu = 0, sigma = 1, lower.tail = TRUE, log.p = FALSE)

qrgumbel(p, mu = 0, sigma = 1, lower.tail = TRUE, log.p = FALSE)

rrgumbel(n, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal-Gumbel distribution has density

$$f(x) = \left[\frac{1}{\sigma} e^{\left(\frac{x-\mu}{\sigma}\right) - e^{\left(\frac{x-\mu}{\sigma}\right)}}\right],$$

where $-\infty < \mu < \infty$ is the location paramether and $\sigma^2 > 0$ is the scale parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Examples

```
drgumbel(1, 3, 4)
prgumbel(1, 3, 4)
qrgumbel(0.2, 3, 4)
rprgumbel(5, 3, 4)
```

ReversalPowerCauchy *The Reversal Power Cauchy Distribution*

Description

Density, distribution function, quantile function and random generation for the reversal power Cauchy distribution with parameters mu, sigma and lambda.

Usage

```
drpcauchy(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

prpcauchy(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qrpcauchy(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rrpcauchy(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power Cauchy distribution has density

$$f(x) = \lambda \left[\frac{1}{\pi} \arctan\left(-\frac{x-\mu}{\sigma}\right) + \frac{1}{2}\right]^{\lambda-1} \left[\frac{1}{\pi\sigma\left(1+\left(\frac{x-\mu}{\sigma}\right)^2\right)}\right]$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Examples

```
drpcauchy(1, 1, 3, 4)
prpcauchy(1, 1, 3, 4)
qrpcauchy(0.2, 1, 3, 4)
rrpcauchy(5, 2, 3, 4)
```

ReversalPowerExponentialPower — *The Reversal Power Exponential Power Distribution*

Description

Density, distribution function, quantile function and random generation for the reversal power exponential power distribution with parameters mu, sigma, lambda and k.

Usage

```
drpexpow(x, lambda = 1, mu = 0, sigma = 1, k = 0, log = FALSE)

prpexpow(q, lambda = 1, mu = 0, sigma = 1, k = 0, lower.tail = TRUE,
  log.p = FALSE)

qrpexpow(p, lambda = 1, mu = 0, sigma = 1, k = 0, lower.tail = TRUE,
  log.p = FALSE)

rrpexpow(n, lambda = 1, mu = 0, sigma = 1, k = 0)
```

Arguments

`x, q`	vector of quantiles.
`mu, sigma`	location and scale parameters.
`k, lambda`	shape parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power exponential power distribution has density

$f(x) = [\lambda/\sigma][f((x-\mu)/\sigma)][F((x-\mu)/\sigma)]^(\lambda-1),$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ and k the shape parameters.

Examples

```
drpexpow(1, 1, 3, 4, 1)
prpexpow(1, 1, 3, 4, 1)
qrpexpow(0.2, 1, 3, 4, 1)
rrpexpow(5, 2, 3, 4, 1)
```

`ReversalPowerLaplace` *The Power Reversal Laplace Distribution*

Description

Density, distribution function, quantile function and random generation for the power reversal Laplace distribution with parameters mu, sigma and lambda.

Usage

```
drplaplace(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

prplaplace(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qrplaplace(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rrplaplace(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \le x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power Laplace distribution has density

$$f(x) = \lambda \left[\frac{1}{2} + \frac{\left(1 - e^{\frac{|x-\mu|}{\sigma}}\right)}{2} \text{sign}\left(-\frac{x-\mu}{\sigma}\right) \right]^{\lambda - 1} \left[\frac{e^{-\frac{|x-\mu|}{\sigma}}}{2\sigma} \right],$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

Examples

```
drplaplace(1, 1, 3, 4)
prplaplace(1, 1, 3, 4)
qrplaplace(0.2, 1, 3, 4)
rrplaplace(5, 2, 3, 4)
```

ReversalPowerLogistic *The Reversal Power Logistic Distribution*

Description

Density, distribution function, quantile function and random generation for the reversal power logistic distribution with parameters mu, sigma and lambda.

Usage

```
drplogis(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

prplogis(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qrplogis(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rrplogis(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power Logistic distribution has density

$f(x) = \lambda \left[\frac{1}{1+e^{\left(\frac{x-\mu}{\sigma}\right)}}\right]^{\lambda-1} \left[\frac{e^{-\left(\frac{x-\mu}{\sigma}\right)}}{\sigma\left(1+e^{-\left(\frac{x-\mu}{\sigma}\right)}\right)^2}\right]$, where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

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Nagler J. (1994) Scobit: an alternative estimator to logit and probit. *American Journal Political Science*, **38**(1), 230-255.

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Examples

```
drplogis(1, 1, 3, 4)
prplogis(1, 1, 3, 4)
qrplogis(0.2, 1, 3, 4)
rrplogis(5, 2, 3, 4)
```

ReversalPowerNormal *The Reversal Power Normal Distribution*

Description

Density, distribution function, quantile function and random generation for the reversal power normal distribution with parameters mu, sigma and lambda.

Usage

```
drpnorm(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

prpnorm(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qrpnorm(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rrpnorm(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power Normal distribution has density

$$f(x) = \lambda \left[\Phi\left(-\frac{x-\mu}{\sigma}\right)\right]^{\lambda-1}\left[\frac{e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}}{\sigma\sqrt{2\pi}}\right],$$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Bazán, J. L., Romeo, J. S. and Rodrigues, J. (2014) Bayesian skew-probit regression for binary response data. *Brazilian Journal of Probability and Statistics*. **28**(4), 467–482.

Examples

```
drpnorm(1, 1, 3, 4)
prpnorm(1, 1, 3, 4)
qrpnorm(0.2, 1, 3, 4)
rrpnorm(5, 2, 3, 4)
```

ReversalPowerReversalGumbel

The Reversal Power Reversal-Gumbel Distribution

Description

Density, distribution function, quantile function and random generation for the reversal power reversal-Gumbel distribution with parameters mu, sigma and lambda.

Usage

```
drprgumbel(x, lambda = 1, mu = 0, sigma = 1, log = FALSE)

prprgumbel(q, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

qrprgumbel(p, lambda = 1, mu = 0, sigma = 1, lower.tail = TRUE,
  log.p = FALSE)

rrprgumbel(n, lambda = 1, mu = 0, sigma = 1)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power reversal-Gumbel distribution has density

$$f(x) = \lambda \left[1 - e^{-e^{\left(-\frac{x-\mu}{\sigma}\right)}}\right]^{\lambda-1} \left[\frac{1}{\sigma} e^{\left(\frac{x-\mu}{\sigma}\right) - e^{\left(\frac{x-\mu}{\sigma}\right)}}\right],$$

where $-\infty < \mu < \infty$ is the location parameter, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

References

Anyosa, S. A. C. (2017) *Binary regression using power and reversal power links*. Master's thesis in Portuguese. Interinstitutional Graduate Program in Statistics. Universidade de São Paulo - Universidade Federal de São Carlos. Available in https://repositorio.ufscar.br/handle/ufscar/9016.

Bazán, J. L., Torres -Avilés, F., Suzuki, A. K. and Louzada, F. (2017) Power and reversal power links for binary regressions: An application for motor insurance policyholders. *Applied Stochastic Models in Business and Industry*, **33**(1), 22-34.

Examples

```
drprgumbel(1, 1, 3, 4)
prprgumbel(1, 1, 3, 4)
qrprgumbel(0.2, 1, 3, 4)
rrprgumbel(5, 2, 3, 4)
```

ReversalPowerT *The Power Reversal Student t Distribution*

Description

Density, distribution function, quantile function and random generation for the power reversal Student t distribution with parameters mu, sigma, lambda and df.

Usage

```
drpt(x, lambda = 1, mu = 0, sigma = 1, df, log = FALSE)

prpt(q, lambda = 1, mu = 0, sigma = 1, df, lower.tail = TRUE,
  log.p = FALSE)

qrpt(p, lambda = 1, mu = 0, sigma = 1, df, lower.tail = TRUE,
  log.p = FALSE)

rrpt(n, lambda = 1, mu = 0, sigma = 1, df)
```

Arguments

`x, q`	vector of quantiles.
`lambda`	shape parameter.
`mu, sigma`	location and scale parameters.
`df`	degrees of freedom (> 0, maybe non-integer). df = Inf is allowed.
`log, log.p`	logical; if TRUE, probabilities p are given as log(p).
`lower.tail`	logical; if TRUE (default), probabilities are $P[X \le x]$, otherwise, P[X > x].
`p`	vector of probabilities.
`n`	number of observations.

Details

The reversal power Student t distribution has density

$f(x) = [\lambda/\sigma][f((x-\mu)/\sigma)][F((x-\mu)/\sigma)]^(\lambda - 1),$

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ the scale parameter and $\lambda > 0$ the shape parameter.

Examples

```
drpt(1, 1, 3, 4, 1)
prpt(1, 1, 3, 4, 1)
qrpt(0.2, 1, 3, 4, 1)
rrpt(5, 2, 3, 4, 1)
```

Index