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

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

where $-\infty < \mu < \infty$ is the location paramether, $\sigma^2 > 0$ 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 $P[X \leq x]$, 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 paramether, $\sigma^2 > 0$ 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 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.

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 parameter, $\sigma^2 > 0$ 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.

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.

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

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

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 $P[X \leq x]$, 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)
```

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