

# Package: powdist (via r-universe)

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**Type** Package

**Title** Power and Reversal Power Distributions

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**Author** Susan Anyosa [aut, cre], Jorge Luis Bazán Guzmán [aut], Artur Lemonte [aut]

**Maintainer** Susan Anyosa <susanaliciach@gmail.com>

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

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powdist-package	<i>Power and reversal power distributions</i>
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### 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).

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ExponentialPower	<i>The Exponential Power Distribution</i>
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### 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 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**

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

**Details**

The Gumbel distribution has density

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

where  $-\infty < \mu < \infty$  is the location parameter 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 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**

```
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

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

where  $-\infty < \mu < \infty$  is the location parameter,  $\sigma^2 > 0$  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)

```

**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

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

**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**

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

**Details**

The power Logistic distribution has density

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

$\sigma^2 > 0$  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.

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 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**

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)
```

**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 parameter,  $\sigma^2 > 0$  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 parameter 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 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**

```
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**

<code>x, q</code>	vector of quantiles.
<code>mu, sigma</code>	location and scale parameters.
<code>k, lambda</code>	shape parameters.
<code>log, log.p</code>	logical; if TRUE, probabilities <code>p</code> are given as $\log(p)$ .
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$ , otherwise, $P[X > x]$ .
<code>p</code>	vector of probabilities.
<code>n</code>	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 parameter,  $\sigma^2 > 0$  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 $P[X \leq x]$ , otherwise, $P[X > x]$ .
p	vector of probabilities.
n	number of observations.

**Details**

The reversal power Laplace distribution has density

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

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

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

**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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**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

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

### 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**

<code>x, q</code>	vector of quantiles.
<code>lambda</code>	shape parameter.
<code>mu, sigma</code>	location and scale parameters.
<code>df</code>	degrees of freedom ( $> 0$ , maybe non-integer). <code>df = Inf</code> is allowed.
<code>log, log.p</code>	logical; if TRUE, probabilities <code>p</code> are given as $\log(p)$ .
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$ , otherwise, $P[X > x]$ .
<code>p</code>	vector of probabilities.
<code>n</code>	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 parameter,  $\sigma^2 > 0$  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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