

# Package ‘gnorm’

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**Title** Generalized Normal/Exponential Power Distribution

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**Suggests** knitr, rmarkdown

## Description

Functions for obtaining generalized normal/exponential power distribution probabilities, quantiles, densities and random deviates. The generalized normal/exponential power distribution was introduced by Subbotin (1923) and rediscovered by Nadarajah (2005). The parametrization given by Nadarajah (2005) <doi:10.1080/02664760500079464> is used.

**License** GPL (>= 2)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.0.1

**VignetteBuilder** knitr

**Type** Package

**URL** <http://github.com/maryclare/gnorm>

**NeedsCompilation** no

**Repository** CRAN

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*The generalized normal distribution***Description**

Density, distribution function and random generation for the generalized normal/exponential power distribution.

A generalized normal random variable  $x$  with parameters  $\mu$ ,  $\alpha > 0$  and  $\beta > 0$  has density:

$$p(x) = \beta \exp(-(|x - \mu|/\alpha)^\beta) / (2\alpha\Gamma(1/\beta)).$$

The mean and variance of  $x$  are  $\mu$  and  $\alpha^2\Gamma(3/\beta)/\Gamma(1/\beta)$ , respectively.

**Usage**

```
dgnorm(x, mu = 0, alpha = 1, beta = 1, log = FALSE)
pgnorm(q, mu = 0, alpha = 1, beta = 1, lower.tail = TRUE, log.p = FALSE)
qgnorm(p, mu = 0, alpha = 1, beta = 1, lower.tail = TRUE, log.p = FALSE)
rgnorm(n, mu = 0, alpha = 1, beta = 1)
```

**Arguments**

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

**Source**

`dgnorm`, `pgnorm`, `qgnorm` and `rgnorm` are all parametrized as in Version 1 of the [Generalized Normal Distribution Wikipedia page](#), which uses the parametrization given by in Nadarajah (2005). The same distribution was described much earlier by Subbotin (1923) and named the exponential power distribution by Box and Tiao (1973).

Box, G. E. P. and G. C. Tiao. "Bayesian inference in Statistical Analysis." Addison-Wesley Pub. Co., Reading, Mass (1973).

Nadarajah, Saralees. "A generalized normal distribution." *Journal of Applied Statistics* 32.7 (2005): 685-694.

Subbotin, M. T. "On the Law of Frequency of Error." *Matematicheskii Sbornik* 31.2 (1923): 206-301.

**Examples**

```
# Plot generalized normal/exponential power density
# that corresponds to the standard normal density
xs <- seq(-1, 1, length.out = 100)
plot(xs, dgnorm(xs, mu = 0, alpha = sqrt(2), beta = 2), type = "l",
      xlab = "x", ylab = expression(p(x)))

# Plot the generalized normal/exponential power CDF
# that corresponds to the standard normal CDF
s <- seq(-1, 1, length.out = 100)
plot(xs, pgnorm(xs, 0, sqrt(2), 2), type = "l", xlab = "q",
      ylab = expression(paste("Pr(", x<=q, ")", sep = "")))

# Plot the generalized normal/exponential power inverse CDF
# that corresponds to the standard normal inverse CDF
xs <- seq(0, 1, length.out = 100)
plot(xs, qgnorm(xs, 0, sqrt(2), 2), type = "l", xlab = "p",
      ylab = expression(paste("q: p = Pr(", x<=q, ")", sep = "")))

# Make a histogram of draws from the generalized normal/exponential
# power distribution that corresponds to a standard normal distribution
xs <- rgnorm(100, 0, sqrt(2), 2)
```

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