Package: ierd (via r-universe)

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Title Inverted Exponentiated Rayleigh Distribution Tools

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Description Provides the density, distribution function, quantile function, random generation, and visualization tools for the Inverted Exponentiated Rayleigh Distribution.

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Contents

dierd *Density of the Inverted Exponentiated Rayleigh Distribution*

Description

This function computes the probability density function (PDF) of the Inverted Exponentiated Rayleigh distribution.

Usage

```
dierd(x, shape, scale)
```

Arguments

x	A numeric vector of quantiles.
shape	A strictly positive numeric value for the shape parameter (α).
scale	A strictly positive numeric value for the scale parameter (β).

Details

The probability density function is mathematically defined as:

$$f(x) = 2\alpha\beta x^{-3} \exp(-\beta/x^2)(1 - \exp(-\beta/x^2))^{\alpha-1}$$

for $x > 0$, where α is the shape parameter and β is the scale parameter.

Value

A numeric vector of density values evaluated at x.

Examples

```
# Compute the density at various values of x
dierd(x = c(0.5, 1, 1.5, 2), shape = 2, scale = 1)
```

pierd *Cumulative Distribution Function of the Inverted Exponentiated Rayleigh Distribution*

Description

This function computes the Cumulative Distribution Function (CDF) of the Inverted Exponentiated Rayleigh distribution.

Usage

```
pierd(t, shape, scale)
```

Arguments

t	A numeric vector of quantiles.
shape	A strictly positive numeric value for the shape parameter (α).
scale	A strictly positive numeric value for the scale parameter (β).

Details

The cumulative distribution function is mathematically defined as:

$$F(t) = 1 - (1 - \exp(-\beta/t^2))^{\alpha}$$

for $t > 0$, where α is the shape parameter and β is the scale parameter.

Value

A numeric vector of cumulative probabilities evaluated at t.

Examples

```
# Compute the cumulative probabilities at various values of t
pierd(t = c(0.5, 1, 1.5, 2), shape = 2, scale = 1)
```

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plot_dierd *Plot Multiple Inverted Exponentiated Rayleigh Densities*

Description

This function creates a ggplot2 visualization comparing the dierd PDF across combinations of shape and scale parameters.

Usage

```
plot_dierd(shape, scale, lower = 0.01, upper = 5, paired = FALSE)
```

Arguments

shape	A numeric vector of strictly positive shape parameters.
scale	A numeric vector of strictly positive scale parameters.
lower	A numeric value for the lower bound of the x-axis (default is 0.01).
upper	A numeric value for the upper bound of the x-axis (default is 5).
paired	Logical. If FALSE (default), creates a full grid of all possible shape and scale combinations. If TRUE, pairs the shape and scale vectors element-by-element (vectors must be the same length).

Value

A ggplot object showing the density curves.

Examples

```
# Full grid: 2 shapes * 2 scales = 4 curves
plot_dierd(shape = c(1, 2), scale = c(1, 2))

# Paired: 2 specific combinations = 2 curves
plot_dierd(shape = c(1, 2), scale = c(1, 2), paired = TRUE)
```

`plot_pierd` *Plot Multiple Inverted Exponentiated Rayleigh CDFs*

Description

This function creates a ggplot2 visualization of the pierd CDF across combinations of shape and scale parameters.

Usage

```
plot_pierd(shape, scale, lower = 0.01, upper = 7.5, paired = FALSE)
```

Arguments

`shape`	A numeric vector of strictly positive shape parameters.
`scale`	A numeric vector of strictly positive scale parameters.
`lower`	A numeric value for the lower bound of the x-axis (default is 0.01).
`upper`	A numeric value for the upper bound of the x-axis (default is 7.5).
`paired`	Logical. If FALSE (default), creates a full grid of all possible shape and scale combinations. If TRUE, pairs the shape and scale vectors element-by-element (vectors must be the same length).

Value

A `ggplot` object showing the cumulative distribution curves.

Examples

```
# Full grid: 2 shapes * 2 scales = 4 curves
plot_pierd(shape = c(1, 2), scale = c(1, 2))

# Paired: 2 specific combinations = 2 curves
plot_pierd(shape = c(1, 2), scale = c(1, 2), paired = TRUE)
```

qierd *Quantile Function of the Inverted Exponentiated Rayleigh Distribution*

Description

This function computes the quantile function (inverse CDF) of the Inverted Exponentiated Rayleigh distribution.

Usage

```
qierd(p, shape, scale)
```

Arguments

p	A numeric vector of probabilities.
shape	A strictly positive numeric value for the shape parameter (α).
scale	A strictly positive numeric value for the scale parameter (β).

Details

The quantile function is mathematically defined as:

$$Q(p) = \sqrt{\frac{-\beta}{\log(1-(1-p)^{1/\alpha})}}$$

for $0 \leq p \leq 1$, where α is the shape parameter and β is the scale parameter.

Value

A numeric vector of quantiles evaluated at p.

Examples

```
# Compute the quantiles at various probability values (e.g., quartiles)
qierd(p = c(0.25, 0.5, 0.75), shape = 2, scale = 1)
```

`rierd` *Random Numbers from the Inverted Exponentiated Rayleigh Distribution*

Description

This function generates random numbers from an Inverted Exponentiated Rayleigh distribution using inverse transform sampling.

Usage

```
rierd(n, shape, scale)
```

Arguments

`n`	An integer specifying the number of random values to return.
`shape`	A strictly positive numeric value for the shape parameter.
`scale`	A strictly positive numeric value for the scale parameter.

Value

A numeric vector of length `n` containing the generated random numbers.

Examples

```
# Generate 10 random numbers with shape = 2 and scale = 1
rierd(n = 10, shape = 2, scale = 1)
```

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