Package ‘dprop’

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Description Generally, most of the packages specify the probability density function, cumulative distribution function, quantile function, and random numbers generation of the probability distributions. The present package allows to compute some important distributional properties, including the first four ordinary and central moments, Pearson's coefficient of skewness and kurtosis, the mean and variance, coefficient of variation, median, and quartile deviation at some parametric values of several well-known and extensively used probability distributions.

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`dprop-package` *Computation of Some Important Distributional Properties*

Description

Generally, most of the packages specify the probability density function, cumulative distribution function, quantile function, and random numbers generation of the probability distributions. The present package allows to compute some important distributional properties, including the first four ordinary and central moments, Pearson's coefficient of skewness and kurtosis, the mean and variance, coefficient of variation, median, and quartile deviation at some parametric values of several well-known and extensively used probability distributions.

Details

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`Beta distribution` *Compute the distributional properties of the beta distribution*

Description

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta distribution.

Usage

```
d_beta(alpha, beta)
```

Arguments

`alpha`	The strictly positive shape parameter of the beta distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the beta distribution ($\beta > 0$).

Details

The following is the probability density function of the beta distribution:

$$f(x) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\,\Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1},$$

where $0 \leq x \leq 1$, $\alpha > 0$ and $\beta > 0$.

Value

d_beta gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>`.

References

Gupta, A. K., & Nadarajah, S. (2004). Handbook of beta distribution and its applications. CRC Press.

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1994). Beta distributions. Continuous univariate distributions. 2nd ed. New York, NY: John Wiley and Sons, 221-235.

See Also

d_kum

Examples

```
d_beta(2,2)
```

Beta exponential distribution

Compute the distributional properties of the beta exponential distribution

---

Description

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta exponential distribution.

Usage

```
d_bexp(lambda, alpha, beta)
```

Arguments

lambda	The strictly positive scale parameter of the exponential distribution ($\lambda > 0$).
alpha	The strictly positive shape parameter of the beta distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the beta distribution ($\beta > 0$).

Details

The following is the probability density function of the beta exponential distribution:

$$f(x) = \frac{\lambda e^{-\beta \lambda x}}{B(\alpha, \beta)} \left(1 - e^{-\lambda x}\right)^{\alpha - 1},$$

where $x > 0$, $\alpha > 0$, $\beta > 0$ and $\lambda > 0$.

Value

d_bexp gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta exponential distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Nadarajah, S., & Kotz, S. (2006). The beta exponential distribution. Reliability Engineering & System Safety, 91(6), 689-697.

See Also

d_beta

Examples

```
d_bexp(1,1,0.2)
```

Birnbaum-Saunders distribution

Compute the distributional properties of the Birnbaum-Saunders distribution

---

Description

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Birnbaum-Saunders distribution.

Usage

```
d_bs(v)
```

Arguments

v	The strictly positive scale parameter of the Birnbaum-Saunders distribution ($v > 0$).

Details

The following is the probability density function of the Birnbaum-Saunders distribution:

$$f(x) = \frac{x^{0.5} + x^{-0.5}}{2vx} \phi\left(\frac{x^{0.5} - x^{-0.5}}{v}\right),$$

where $x > 0$ and $v > 0$.

Value

d_bs gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Birnbaum-Saunders distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Chan, S., Nadarajah, S., & Afuecheta, E. (2016). An R package for value at risk and expected shortfall. Communications in Statistics Simulation and Computation, 45(9), 3416-3434.

See Also

d_normal

Examples

```
d_bs(5)
```

Burr XII distribution *Compute the distributional properties of the Burr XII distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Burr XII distribution.

Usage

```
d_burr(k, c)
```

Arguments

k	The strictly positive shape parameter of the Burr XII distribution ($k > 0$).
c	The strictly positive shape parameter of the Burr XII distribution ($c > 0$).

Details

The following is the probability density function of the Burr XII distribution:

$$f(x) = kcx^{c-1}\left(1 + x^c\right)^{-k-1},$$

where $x > 0$, $c > 0$ and $k > 0$.

Value

d_burr gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Burr XII distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Rodriguez, R. N. (1977). A guide to the Burr type XII distributions. Biometrika, 64(1), 129-134.

Zimmer, W. J., Keats, J. B., & Wang, F. K. (1998). The Burr XII distribution in reliability analysis. Journal of Quality Technology, 30(4), 386-394.

See Also

d_kburr

Examples

```
d_burr(2,10)
```

Chen distribution — *Compute the distributional properties of the Chen distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Chen distribution.

Usage

```
d_chen(k, c)
```

Arguments

k	The strictly positive shape parameter of the Chen distribution ($k > 0$).
c	The strictly positive scale parameter of the Chen distribution ($c > 0$).

Details

The following is the probability density function of the Chen distribution:

$$f(x) = ckx^{k-1}e^{x^k}e^{c-ce^{x^k}},$$

where $x > 0$, $c > 0$ and $k > 0$.

Value

d_chen gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Chen distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Chen, Z. (2000). A new two-parameter lifetime distribution with bathtub shape or increasing failure rate function. Statistics & Probability Letters, 49(2), 155–161.

See Also

d_wei, d_EE, d_EW

Examples

```
d_chen(0.2,0.2)
```

Chi-squared distribution

Compute the distributional properties of the Chi-squared distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the (non-central) Chi-squared distribution.

Usage

```
d_chi(n)
```

Arguments

`n`	It is a degree of freedom and the positive parameter of the Chi-squared distribution ($n > 0$).

Details

The following is the probability density function of the (non-central) Chi-squared distribution:

$$f(x) = \frac{1}{2^{\frac{n}{2}}\Gamma(\frac{n}{2})} x^{\frac{n}{2}-1} e^{-\frac{x}{2}},$$

where $x > 0$ and $n > 0$.

Value

d_chi gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the (non-central) Chi-squared distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>`.

References

Ding, C. G. (1992). Algorithm AS275: computing the non-central chi-squared distribution function. Journal of the Royal Statistical Society. Series C (Applied Statistics), 41(2), 478-482.

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous univariate distributions, volume 2 (Vol. 289). John Wiley & Sons.

See Also

`d_gamma`

Examples

```
d_chi(2)
```

`Exponential distribution` *Compute the distributional properties of the exponential distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential distribution.

Usage

```
d_exp(alpha)
```

Arguments

`alpha`	The strictly positive scale parameter of the exponential distribution ($\alpha > 0$).

Details

The following is the probability density function of the exponential distribution:

$$f(x) = \alpha e^{-\alpha x},$$

where $x > 0$ and $\alpha > 0$.

Value

d_exp gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>`.

References

Balakrishnan, K. (2019). Exponential distribution: theory, methods and applications. Routledge.

Singh, A. K. (1997). The exponential distribution-theory, methods and applications, Technometrics, 39(3), 341-341.

See Also

`d_wei`, `d_EE`

Examples

```
d_exp(2)
```

`Exponential extension distribution`
Compute the distributional properties of the exponential extension distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential extension distribution.

Usage

```
d_nh(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the exponential extension distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the exponential extension distribution ($\beta > 0$).

Details

The following is the probability density function of the exponential extension distribution:

$$f(x) = \alpha\beta(1 + \alpha x)^{\beta-1}e^{1-(1+\alpha x)^{\beta}},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_nh gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential extension distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Nadarajah, S., & Haghighi, F. (2011). An extension of the exponential distribution. Statistics, 45(6), 543-558.

See Also

d_exp

Examples

```
d_nh(0.5,1)
```

Exponentiated exponential distribution

Compute the distributional properties of the exponentiated exponential distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated exponential distribution.

Usage

```
d_EE(alpha, beta)
```

Arguments

alpha	The strictly positive scale parameter of the exponential distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the exponentiated exponential distribution ($\beta > 0$).

Details

The following is the probability density function of the exponentiated exponential distribution:

$$f(x) = \alpha\beta e^{-\alpha x}\left(1 - e^{-\alpha x}\right)^{\beta-1},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_EE gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated exponential distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Nadarajah, S. (2011). The exponentiated exponential distribution: a survey. AStA Advances in Statistical Analysis, 95, 219-251.

Gupta, R. D., & Kundu, D. (2007). Generalized exponential distribution: Existing results and some recent developments. Journal of Statistical Planning and Inference, 137(11), 3537-3547.

See Also

`d_EW`, `d_wei`, `d_exp`

Examples

```
d_EE(5,2)
```

`Exponentiated Weibull distribution`
Compute the distributional properties of the exponentiated Weibull distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated Weibull distribution.

Usage

```
d_EW(a, beta, zeta)
```

Arguments

`a`	The strictly positive shape parameter of the exponentiated Weibull distribution $(a > 0)$.
`beta`	The strictly positive scale parameter of the baseline Weibull distribution $(\beta > 0)$.
`zeta`	The strictly positive shape parameter of the baseline Weibull distribution $(\zeta > 0)$.

Details

The following is the probability density function of the exponentiated Weibull distribution:

$$f(x) = a\zeta\beta^{-\zeta}x^{\zeta-1}e^{-\left(\frac{x}{\beta}\right)^{\zeta}}\left[1-e^{-\left(\frac{x}{\beta}\right)^{\zeta}}\right]^{a-1},$$

where $x > 0$, $a > 0$, $\beta > 0$ and $\zeta > 0$.

Value

d_EW gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated Weibull distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Nadarajah, S., Cordeiro, G. M., & Ortega, E. M. (2013). The exponentiated Weibull distribution: a survey. Statistical Papers, 54, 839-877.

See Also

d_EE, d_wei

Examples

```
d_EW(1,1,0.5)
```

F distribution — *Compute the distributional properties of the F distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the F distribution.

Usage

```
d_F(alpha, beta)
```

Arguments

alpha	The strictly positive parameter of the F distribution ($\alpha > 0$).
beta	The strictly positive parameter of the F distribution ($\beta > 0$).

Details

The following is the probability density function of the F distribution:

$$f(x) = \frac{1}{B(\frac{\alpha}{2}, \frac{\beta}{2})} \left(\frac{\alpha}{\beta}\right)^{\frac{\alpha}{2}} x^{\frac{\alpha}{2}-1} \left(1 + \frac{\alpha}{\beta}x\right)^{-\left(\frac{\alpha+\beta}{2}\right)},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_F gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the F distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous univariate distributions, volume 2 (Vol. 289). John Wiley & Sons.

See Also

d_gamma

Examples

```
d_F(2,10)
```

Frechet distribution — *Compute the distributional properties of the Frechet distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Frechet distribution.

Usage

```
d_fre(alpha, beta, zeta)
```

Arguments

alpha	The parameter of the Frechet distribution ($\alpha > 0$).
beta	The parameter of the Frechet distribution ($\beta \in (-\infty, +\infty)$).
zeta	The parameter of the Frechet distribution ($\zeta > 0$).

Details

The following is the probability density function of the Frechet distribution:

$$f(x) = \frac{\alpha}{\zeta}\left(\frac{x-\beta}{\zeta}\right)^{-1-\alpha} e^{-(\frac{x-\beta}{\zeta})^{-\alpha}},$$

where $x > \beta$, $\alpha > 0$, $\zeta > 0$ and $\beta \in (-\infty, +\infty)$. The Frechet distribution is also known as inverse Weibull distribution and special case of the generalized extreme value distribution.

Value

d_fre gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Frechet distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Abbas, K., & Tang, Y. (2015). Analysis of Frechet distribution using reference priors. Communications in Statistics-Theory and Methods, 44(14), 2945-2956.

See Also

d_wei

Examples

```
d_fre(5,1,0.5)
```

Gamma distribution — *Compute the distributional properties of the gamma distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the gamma distribution.

Usage

```
d_gamma(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the gamma distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the gamma distribution ($\beta > 0$).

Details

The following is the probability density function of the gamma distribution:

$$f(x) = \frac{\beta^{\alpha}}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_gamma the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the gamma distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Burgin, T. A. (1975). The gamma distribution and inventory control. Journal of the Operational Research Society, 26(3), 507-525.

See Also

`d_wei`, `d_naka`

Examples

```
d_gamma(2,2)
```

`Gompertz distribution` *Compute the distributional properties of the Gompertz distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gompertz distribution.

Usage

```
d_gompertz(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the Gompertz distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the Gompertz distribution ($\beta > 0$).

Details

The following is the probability density function of the Gompertz distribution:

$$f(x) = \alpha e^{\beta x - \frac{\alpha}{\beta}\left(e^{\beta x} - 1\right)},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_gompertz gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gompertz distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Soliman, A. A., Abd-Ellah, A. H., Abou-Elheggag, N. A., & Abd-Elmougod, G. A. (2012). Estimation of the parameters of life for Gompertz distribution using progressive first-failure censored data. Computational Statistics & Data Analysis, 56(8), 2471-2485.

See Also

`d_fre`

Examples

```
d_gompertz(2,2)
```

Gumbel distribution *Compute the distributional properties of the Gumbel distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gumbel distribution.

Usage

```
d_gumbel(alpha, beta)
```

Arguments

alpha	Location parameter of the Gumbel distribution ($\alpha \in (-\infty, +\infty)$).
beta	The strictly positive scale parameter of the Gumbel distribution ($\beta > 0$).

Details

The following is the probability density function of the Gumbel distribution:

$$f(x) = \frac{1}{\beta} e^{-(z+e^{-z})},$$

where $z = \frac{x-\alpha}{\beta}$, $x \in (-\infty, +\infty)$, $\alpha \in (-\infty, +\infty)$ and $\beta > 0$.

Value

d_gumbel gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gumbel distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Gomez, Y. M., Bolfarine, H., & Gomez, H. W. (2019). Gumbel distribution with heavy tails and applications to environmental data. Mathematics and Computers in Simulation, 157, 115-129.

See Also

d_gompertz, d_fre

Examples

```
d_gumbel(1,2)
```

`Inverse-gamma distribution` *Compute the distributional properties of the inverse-gamma distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the inverse-gamma distribution.

Usage

```
d_ingam(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the inverse-gamma distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the inverse-gamma distribution ($\beta > 0$).

Details

The following is the probability density function of the inverse-gamma distribution:

$$f(x) = \frac{\beta^\alpha}{\Gamma(\alpha)} x^{-\alpha-1} e^{-\frac{\beta}{x}},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_ingam gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the inverse-gamma distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>`.

References

Rivera, P. A., Calderín-Ojeda, E., Gallardo, D. I., & Gómez, H. W. (2021). A compound class of the inverse Gamma and power series distributions. Symmetry, 13(8), 1328.

Glen, A. G. (2017). On the inverse gamma as a survival distribution. Computational Probability Applications, 15-30.

See Also

d_gamma

Examples

```
d_ingam(5,2)
```

Kumaraswamy Burr XII distribution
Compute the distributional properties of the Kumaraswamy Burr XII distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy Burr XII distribution.

Usage

```
d_kburr(a, b, k, c)
```

Arguments

a	The strictly positive parameter of the Kumaraswamy distribution ($a > 0$).
b	The strictly positive parameter of the Kumaraswamy distribution ($b > 0$).
k	The strictly positive parameter of the Burr XII distribution ($k > 0$).
c	The strictly positive parameter of the Burr XII distribution ($c > 0$).

Details

The following is the probability density function of the Kumaraswamy Burr XII distribution:

$$f(x) = \frac{abkcx^{c-1}}{(1+x^c)^{k+1}}\left[1-(1+x^c)^{-k}\right]^{a-1}\left\{1-\left[1-(1+x^c)^{-k}\right]^a\right\}^{b-1},$$

where $x > 0$, $a > 0$, $b > 0$, $k > 0$ and $c > 0$.

Value

d_kburr gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy Burr XII distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Paranaiba, P. F., Ortega, E. M., Cordeiro, G. M., & Pascoa, M. A. D. (2013). The Kumaraswamy Burr XII distribution: theory and practice. Journal of Statistical Computation and Simulation, 83(11), 2117-2143.

See Also

`d_kum`, `d_kexp`

Examples

```
d_kburr(1.5,1,1,7)
```

`Kumaraswamy distribution` *Compute the distributional properties of the Kumaraswamy distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy distribution.

Usage

```
d_kum(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the Kumaraswamy distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the Kumaraswamy distribution ($\beta > 0$).

Details

The following is the probability density function of the Kumaraswamy distribution:

$$f(x) = \alpha\beta x^{\alpha-1} \left(1 - x^{a}\right)^{\beta-1},$$

where $0 \leq x \leq 1$, $\alpha > 0$ and $\beta > 0$.

Value

d_kum gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation at some parametric values based on the Kumaraswamy distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

El-Sherpieny, E. S. A., & Ahmed, M. A. (2014). On the kumaraswamy distribution. International Journal of Basic and Applied Sciences, 3(4), 372.

Mitnik, P. A. (2013). New properties of the Kumaraswamy distribution. Communications in Statistics-Theory and Methods, 42(5), 741-755.

Dey, S., Mazucheli, J., & Nadarajah, S. (2018). Kumaraswamy distribution: different methods of estimation. Computational and Applied Mathematics, 37, 2094-2111.

See Also

d_beta

Examples

```
d_kum(2,2)
```

Kumaraswamy exponential distribution

Compute the distributional properties of the Kumaraswamy exponential distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy exponential distribution.

Usage

```
d_kexp(lambda, a, b)
```

Arguments

a	The strictly positive shape parameter of the Kumaraswamy distribution ($a > 0$).
b	The strictly positive shape parameter of the Kumaraswamy distribution ($b > 0$).
lambda	The strictly positive parameter of the exponential distribution ($\lambda > 0$).

Details

The following is the probability density function of the Kumaraswamy exponential distribution:

$$f(x) = ab\lambda e^{-\lambda x}\left(1 - e^{-\lambda x}\right)^{a-1}\left\{1 - \left(1 - e^{-\lambda x}\right)^{a}\right\}^{b-1},$$

where $x > 0$, $a > 0$, $b > 0$ and $\lambda > 0$.

Value

d_kexp gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy exponential distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Cordeiro, G. M., & de Castro, M. (2011). A new family of generalized distributions. Journal of Statistical Computation and Simulation, 81(7), 883-898.

See Also

d_kburr, d_kum

Examples

```
d_kexp(0.2,1,1)
```

Kumaraswamy normal distribution

Compute the distributional properties of the Kumaraswamy normal distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy normal distribution.

Usage

```
d_kumnorm(mu, sigma, a, b)
```

Arguments

`mu`	The location parameter of the normal distribution ($\mu \in (-\infty, +\infty)$).
`sigma`	The strictly positive scale parameter of the normal distribution ($\sigma > 0$).
`a`	The strictly positive shape parameter of the Kumaraswamy distribution ($a > 0$).
`b`	The strictly positive shape parameter of the Kumaraswamy distribution ($b > 0$).

Details

The following is the probability density function of the Kumaraswamy normal distribution:

$$f(x) = \frac{ab}{\sigma}\phi\left(\frac{x-\mu}{\sigma}\right)\left[\Phi\left(\frac{x-\mu}{\sigma}\right)\right]^{a-1}\left[1-\Phi\left(\frac{x-\mu}{\sigma}\right)^{a}\right]^{b-1},$$

where $x \in (-\infty, +\infty)$, $\mu \in (-\infty, +\infty)$, $\sigma > 0$, $a > 0$ and $b > 0$. The functions $\phi(.)$ and $\Phi(.)$, denote the probability density function and cumulative distribution function of the standard normal variable, respectively.

Value

d_kumnorm gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy normal distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Cordeiro, G. M., & de Castro, M. (2011). A new family of generalized distributions. Journal of Statistical Computation and Simulation, 81(7), 883-898.

See Also

`d_kburr`, `d_kexp`, `d_kum`

Examples

```
d_kumnorm(0.2,0.2,2,2)
```

`Laplace distribution` *Compute the distributional properties of the Laplace or double exponential distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Laplace distribution.

Usage

```
d_lap(alpha, beta)
```

Arguments

`alpha`	Location parameter of the Laplace distribution ($\alpha \in (-\infty, +\infty)$).
`beta`	The strictly positive scale parameter of the Laplace distribution ($\beta > 0$).

Details

The following is the probability density function of the Laplace distribution:

$$f(x) = \frac{1}{2\beta} e^{\frac{-|x-\alpha|}{\beta}},$$

where $x \in (-\infty, +\infty)$, $\alpha \in (-\infty, +\infty)$ and $\beta > 0$.

Value

d_lap gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation at some parametric values based on the Laplace distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Cordeiro, G. M., & Lemonte, A. J. (2011). The beta Laplace distribution. Statistics & Probability Letters, 81(8), 973-982.

See Also

`d_normal`

Examples

```
d_lap(2,4)
```

`Log-normal distribution` *Compute the distributional properties of the log-normal distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the log-normal distribution.

Usage

```
d_lnormal(mu, sigma)
```

Arguments

`mu`	The location parameter ($\mu \in (-\infty, +\infty)$).
`sigma`	The strictly positive scale parameter of the log-normal distribution ($\sigma > 0$).

Details

The following is the probability density function of the log-normal distribution:

$$f(x) = \frac{1}{x\sigma\sqrt{2\pi}} e^{-\frac{(\log(x)-\mu)^2}{2\sigma^2}},$$

where $x > 0$, $\mu \in (-\infty, +\infty)$ and $\sigma > 0$.

Value

d_lnormal gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the log-normal distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous Univariate Distributions, Volume 1, Chapter 14. Wiley, New York.

See Also

d_normal

Examples

```
d_lnormal(1,0.5)
```

Logistic distribution *Compute the distributional properties of the logistic distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the logistic distribution.

Usage

```
d_logis(mu, sigma)
```

Arguments

mu	Location parameter of the logistic distribution ($\mu \in (-\infty, +\infty)$).
sigma	The strictly positive scale parameter of the logistic distribution ($\sigma > 0$).

Details

The following is the probability density function of the logistic distribution:

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

where $x \in (-\infty, +\infty)$, $\mu \in (-\infty, +\infty)$ and $\sigma > 0$.

Value

d_logis gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the logistic distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous univariate distributions, Volume 2 (Vol. 289). John Wiley & Sons.

See Also

`d_lnormal`

Examples

```
d_logis(4,0.2)
```

`Lomax distribution` *Compute the distributional properties of the Lomax distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Lomax distribution.

Usage

```
d_lom(alpha, beta)
```

Arguments

`alpha`	The strictly positive parameter of the Lomax distribution ($\alpha > 0$).
`beta`	The strictly positive parameter of the Lomax distribution ($\beta > 0$).

Details

The following is the probability density function of the Lomax distribution:

$$f(x) = \frac{\alpha}{\beta}\left(1 + \frac{x}{\beta}\right)^{-\alpha-1},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_lom gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Lomax distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>`.

References

Abd-Elfattah, A. M., Alaboud, F. M., & Alharby, A. H. (2007). On sample size estimation for Lomax distribution. Australian Journal of Basic and Applied Sciences, 1(4), 373-378.

See Also

d_gamma

Examples

```
d_lom(10,10)
```

Nakagami distribution *Compute the distributional properties of the Nakagami distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Nakagami distribution.

Usage

```
d_naka(alpha, beta)
```

Arguments

alpha	The strictly positive parameter of the Nakagami distribution ($\alpha > 0$).
beta	The strictly positive parameter of the Nakagami distribution ($\beta > 0$).

Details

The following is the probability density function of the Nakagami distribution:

$$f(x) = \frac{2\alpha^\alpha}{\Gamma(\alpha)\beta^\alpha} x^{2\alpha-1} e^{-\frac{\alpha x^2}{\beta}},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_naka gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Nakagami distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Schwartz, J., Godwin, R. T., & Giles, D. E. (2013). Improved maximum-likelihood estimation of the shape parameter in the Nakagami distribution. Journal of Statistical Computation and Simulation, 83(3), 434-445.

See Also

d_gamma

Examples

```
d_naka(2,2)
```

Normal distribution — *Compute the distributional properties of the normal distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the normal distribution.

Usage

```
d_normal(alpha, beta)
```

Arguments

alpha	Location parameter of the normal distribution ($\alpha \in (-\infty, +\infty)$).
beta	The strictly positive scale parameter of the normal distribution ($\beta > 0$).

Details

The following is the probability density function of the normal distribution:

$$f(x) = \frac{1}{\beta\sqrt{2\pi}} e^{-0.5\left(\frac{x-\alpha}{\beta}\right)^2},$$

where $x \in (-\infty, +\infty)$, $\alpha \in (-\infty, +\infty)$ and $\beta > 0$. The parameters α and β represent the mean and standard deviation, respectively.

Value

d_normal gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the normal distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Patel, J. K., & Read, C. B. (1996). Handbook of the normal distribution (Vol. 150). CRC Press.

See Also

`d_lnormal`

Examples

```
d_normal(4,0.2)
```

`Rayleigh distribution` *Compute the distributional properties of the Rayleigh distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Rayleigh distribution.

Usage

```
d_rayl(alpha)
```

Arguments

`alpha`	The strictly positive parameter of the Rayleigh distribution ($\alpha > 0$).

Details

The following is the probability density function of the Rayleigh distribution:

$$f(x) = \frac{x}{\alpha^2} e^{-\frac{x^2}{2\alpha^2}},$$

where $x > 0$, $\alpha > 0$.

Value

d_rayl gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Rayleigh distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Forbes, C., Evans, M. Hastings, N., & Peacock, B. (2011). Statistical Distributions. John Wiley & Sons.

See Also

d_wei

Examples

```
d_rayl(2)
```

Student's t distribution

Compute the distributional properties of the Student distribution

---

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Student t distribution.

Usage

```
d_st(v)
```

Arguments

v	The strictly positive parameter of the Student distribution ($v > 0$), it is also called a degree of freedom.

Details

The following is the probability density function of the Student t distribution:

$$f(x) = \frac{\Gamma(\frac{v+1}{2})}{\sqrt{v\pi}\Gamma(\frac{v}{2})}\left(1 + \frac{x^2}{v}\right)^{-(v+1)/2},$$

where $x \in (-\infty, +\infty)$ and $v > 0$.

Value

d_st gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Student t distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Yang, Z., Fang, K. T., & Kotz, S. (2007). On the Student's t-distribution and the t-statistic. Journal of Multivariate Analysis, 98(6), 1293-1304.

Ahsanullah, M., Kibria, B. G., & Shakil, M. (2014). Normal and Student's t distributions and their applications (Vol. 4). Paris, France: Atlantis Press.

See Also

d_chi

Examples

```
d_st(6)
```

`Weibull distribution` *Compute the distributional properties of the Weibull distribution*

Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Weibull distribution.

Usage

```
d_wei(alpha, beta)
```

Arguments

alpha	The strictly positive scale parameter of the Weibull distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the Weibull distribution ($\beta > 0$).

Details

The following is the probability density function of the Weibull distribution:

$$f(x) = \frac{\beta}{\alpha}\left(\frac{x}{\alpha}\right)^{\beta-1} e^{-(\frac{x}{\alpha})^{\beta}},$$

where $x > 0$, $\alpha > 0$ and $\beta > 0$.

Value

d_wei gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Weibull distribution.

Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

References

Hallinan Jr, Arthur J. (1993). A review of the Weibull distribution. Journal of Quality Technology, 25(2), 85-93.

See Also

d_EE

Examples

```
d_wei(2,2)
```

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