Continuous Uniform Distribution

This is an example Quiz. See the Quiz 'Assessment 5' for the actual version you should attempt.

Question 1 (1 point)

Suppose

$$Y \sim Uniform(\theta_1, \theta_2)$$

where the parameters

$$\theta_1 \quad \text{and} \quad \theta_2$$

take the values 0 and 2 respectively. Compute the probability

$$P(Y \leq y)$$

when *y=0.65.*

Your Answer:

Answer

Normal distribution I

Question 2 (2 points)

Suppose that *Y* is a continuous random variable, with

$$Y \sim Normal(\mu, \sigma^2)$$

where the two parameters

$$\mu \quad \text{and} \quad \sigma$$

take values 2 and 0.5 respectively. Using the table of the Normal distribution, compute

$$P(Y > y)$$

if *y*=1.608. Give your answer to 3 decimal places.

Note that the Normal table can be used for arguments specified up to two decimal places, so round your arguments appropriately.

Your Answer:

Answer

EXAMPLE

Normal distribution II

Question 3 (2 points)

Suppose that Y is a continuous random variable, with

$$Y \sim Normal(\mu, \sigma^2)$$

where the two parameters

$$\mu \quad \text{and} \quad \sigma$$

take values 1 and 2 respectively. Using the table of the Normal distribution, compute

$$P(0.614 < Y < 2.462)$$

Give your answer to 3 decimal places.

Note that the Normal table can be used for arguments specified up to two decimal places, so round your arguments appropriately.

Your Answer:

Answer

Gamma distribution

Question 4 (4 points)

The Gamma pdf for continuous random variable Y takes the form

$$f(y) = \begin{cases} \frac{1}{\beta^\alpha \Gamma(\alpha)} y^{\alpha-1} e^{-y/\beta} & y > 0 \\ 0 & y \leq 0 \end{cases} \qquad \text{for } \alpha, \beta > 0.$$

If the two parameters

$$\alpha \quad \text{and} \quad \beta$$

take the values 2 and 0.9 respectively, compute the probability

$$\mathrm{P(Y > 1.65)}$$

Give your answer to three decimal places.

Your Answer:

EXAMPLE

Answer

Exponential distribution

Question 5 (2 points)

The Exponential pdf for continuous random variable Y takes the form

$$f(y) = \begin{cases} \frac{1}{\beta} e^{-y/\beta} & y > 0 \\ 0 & y \leq 0 \end{cases} \quad \text{for } \beta > 0.$$

Suppose that a new random variable X is defined by

$$X = cY.$$

If the parameter

$$\beta$$

takes the value 2.10, and c=2, compute the probability

P(X < 1.9)

Give your answer to three decimal places.

Your Answer:

Answer

Transformations

Question 6 (3 points)

Suppose that

$$Y \sim Exponential(\beta)$$

and let

$$X = \sqrt{Y}$$

be a new continuous random variable. If parameter

EXAMPLE

β

takes the value 0.5, compute

P(X < 2.5).

Give your answer to three decimal places.

Your Answer:

Answer

Central Limit Theorem

Question 7 (3 points)

The central limit theorem states that if

$$Y_1, Y_2, \ldots, Y_n$$

are a sequence of random variables that are **independent** and **identically distributed** with

$$\mathbb{E}[Y_i] = \mu \qquad \mathbb{V}[Y_i] = \sigma^2$$

for each i (with both of those quantities being **finite**), and

$$\overline{Y}_n = \frac{1}{n}\sum_{i=1}^{n} Y_i$$

is the sample mean random variable, when n is large, we can **approximate** the distribution of the sample mean as

$$\overline{Y}_n \sim Normal(\mu, \sigma^2/n)$$

and also approximate the distribution of the sum

$$S_n = \sum_{i=1}^{n} Y_i$$

as

$$S_n \sim Normal(n\mu, n\sigma^2).$$

Question: Suppose that a fair coin is tossed 300 times with the results of the tosses regarded as independent events. Use the central limit theorem to approximate the probability that the total number of heads obtained is greater than 163.

- use the Normal probability tables to look up the probability

EXAMPLE

- the table can be used for arguments specified up to 2 decimal places, **so round your argument appropriately**
- do not use a continuity correction.

Your Answer:

Answer

Continuous distributions

Question 8 (3 points)

Suppose that a pdf for a continuous random variable Y takes the form

$$f(y) = \frac{1}{\sigma} \frac{e^{-(y-\mu)/\sigma}}{(1+e^{-(y-\mu)/\sigma})^2} \quad y \in \mathbb{R} \qquad \text{where } \mu \in \mathbb{R}, \sigma > 0$$

If the two parameters

$$\mu \quad \text{and} \quad \sigma$$

take the values -4.2 and 1.0 respectively, compute the probability

P(Y < 0.3).

Your Answer:

Answer

EXAMPLE

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