MATH 451/551

Chapter 5. Common Continuous Distribution

5.1 Uniform Distribution

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Parameters

Parameters

- **Location** (or shift) parameters
- **Scale** parameters are used to expand or contract the x-axis by a factor
- **Shape** parameters affect the shape of the probability density function

Uniform Distribution

Uniform Distribution

- A continuous random variable X is "uniformly distributed" between a and b if X is equally likely to assume any value on the interval (a, b).

- A continuous random variable X with pdf

$$f(x) = \frac{1}{b-a}, \quad a < x < b$$

for real constants a and b satisfying $a < b$ is a $U(a, b)$ random variable.

R Functions

R Functions

Function	Returned Value
dunif(x, a, b)	calculates the probability density function $f(x)$
punif(x, a, b)	calculates the cumulative distribution function $F(x)$
qunif(u, a, b)	calculates the percentile (quantile) $F^{-1}(u)$
runif(m, a, b)	generates m random variates

Example 1

10

Example 1

A shuttle train at a busy airport completes a circuit between two terminals every five minutes. What is the probability that a passenger will wait more than three minutes for a shuttle train?

Example 2

11

Example 2

What is the probability that the quadratic equation $x^2 + Bx + 1 = 0$ has two real roots, where $B \sim U(0, 3)$? (Hint: The quadratic equation $ax^2 + bx + c = 0$ has two real roots if the discriminant $b^2 - 4ac$ is positive.)

Example 3

12

Example 3

Let $X \sim U(0, 1)$, find $V(3\lfloor 2X \rfloor + 4)$.

Example 4

13

Example 4

Divide a line segment of unit length randomly into two parts. Find the expected value of the product of the lengths of the two segments.

THANK YOU!