

Homework Assignment for Chapter 6 (Due by 3pm on Feb. 18)

Reference Exercise Problems: Text Book, 6.6 Exercises.

Homework problems

Problem 1 Let U have a $U(0, 1)$ distribution.

- Describe how to simulate the outcome of a roll with a D&D (Dungeons and Dragons) die (has 20 sides) using U .
- Define Y as follows: round $20U + 1$ down to the nearest integer. What are the possible outcomes of Y and their probabilities?

Problem 2 Let X have a $U(0, 2)$ distribution. Show that $Y = 2 - X$ has a $U(0, 2)$ distribution by deriving the probability density function or the distribution function.

Problem 3 Somebody messed up the random number generator in your computer: instead of uniform random numbers it generates numbers with an $Exp(4)$ distribution. Describe how to construct a $U(0, 1)$ random variable U from an $Exp(4)$ distributed X .

Hint: look at how you obtain an $Exp(4)$ random variable from a $U(0, 1)$ random variable.

Problem 4 In models for the lifetimes of mechanical components one sometimes uses random variables with distribution functions from the so-called Weibull family. Here is an example: $F(x) = 0$ for $x < 0$, and

$$F(x) = 1 - e^{-2x^2} \text{ for } x \geq 0.$$

Construct a random variable Z with this distribution from a $U(0, 1)$ variable.

Problem 5 A random variable X has a $Par(2)$ distribution, so with distribution function F with $F(x) = 0$ for $x < 1$, and $F(x) = 1 - x^{-2}$ for $x \geq 1$. For details on the Pareto distribution see Section 5.4. Describe how to construct X from a $U(0, 1)$ random variable.