

Short Test Probability Theory, April 29, 2021

16.15-17.00 (extra time: 16.15-17.10)

- Please write your answers on a sheet of paper, mention your name and student number. After the test, upload your answers as one single pdf via Canvas within 10 minutes, or give it to your TA if you are on campus.
- You may use a simple calculator for this test, but this is not necessary.
- You have to keep track of the time yourself. Make sure that you stop at 17.00 (or 10 minutes later if you have extra time).
- If you want to stop before the end of the test, ask permission of the TA via the chat. Upload your answers within 10 minutes and let the TA know in the chat when you have finished uploading.
- Your grade is given by 1+ number of points.
- Explain your answers clearly, use notation and explanation, don't just write numbers!

Exercise 1. Let X and Y be independent continuous random variables with marginal density functions

$$f_X(x) = \begin{cases} e^{-x-1} & \text{if } x \geq -1, \\ 0 & \text{otherwise,} \end{cases}$$

and

$$f_Y(y) = \begin{cases} e^{-y+2} & \text{if } y \geq 2, \\ 0 & \text{otherwise.} \end{cases}$$

- (a) [3.5 points] Compute the density function of $Z := X + Y$.
(b) [3.5 points] Compute $P(Y > X)$.

Exercise 2. [2 points] Let X and Y be standard normal random variables. Identify the distribution of $W := 3X - 4Y$ (so give the name of the distribution of W and the values of its parameters).