NAME: ..... NEPTUN: .....

Exam, 2017 05 10 – 50 minutes

1. In a box there are 2 red and 3 blue balls. You pick balls, one after the other with replacement. You stop picking when the first time a blue is drawn. Let X mean the number of draws you make.

   (a) Set up the formula of the weight function of the distribution of X.

   (b) If you made 1000 experiments, approximately how much would be the average of the number of draws?

2. The number of mobile phones ringing during a theatre performance is a random variable.

   (a) Explain why this random variable follows Poisson distribution.

   (b) Assume that the probability that no mobile phones ring during a theatre performance is 0.6. What is the average number of mobile phones ringing during a theatre performance?

3. Assume that the amount of milk in a bottle sold in a supermarket has a normal distribution with expectation 1 liter and standard deviation 0.01 liter.

   (a) Out of 1000 bottles approximately how many contain more than 1.02 liter of milk?

   (b) Determine the probability that out of 5 such bottles more than 2 contain less than 0.99 liter of milk.

4. X is a random variable with values between $-\infty$ and ∞. The density function of X is $f(x) = \mathrm{e}^{-2|x|}$.

   (a) What is the probability that $-1 < X < 1$?

   (b) Determine the expected value of of X^2.

5. The weight and the height of a randomly chosen woman – as a two-dimensional random variable – follows a two-dimensional normal distribution. The standard deviation of the weight of women with a height of 175 centimeters is 4 kg. The correlation coefficient is 0.8.

   (a) How much is the standard deviation of the weight of women?

   (b) How much is the standard deviation of the weight of women who are 165 centimeters tall?

6. Give the meaning of the standard deviation of

   (a) the data set $\{1; 3; 7; 8; 11\}$ by making simple calculations (without using calculator). *(Show the details of your calculations.)*

   (b) a continuous random variable by a correct mathematical formula.

Standard normal distribution function

x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
0,0	0,50	0,5	0,69	1,0	0,84	1,5	0,93	2,0	0,98	2,5	0,99
0,1	0,54	0,6	0,73	1,1	0,86	1,6	0,95	2,1	0,98	2,6	1,00
0,2	0,58	0,7	0,76	1,2	0,88	1,7	0,96	2,2	0,99		
0,3	0,62	0,8	0,79	1,3	0,90	1,8	0,96	2,3	0,99		
0,4	0,66	0,9	0,82	1,4	0,92	1,9	0,97	2,4	0,99		