

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

**Pre-Exam, 2016 12 14, 10pm, 90 minutes**

1. In a box there are 3 red and 5 blue balls. You pick one ball, do not look at it, but throw it out of the window.
  - (a) Then you pick another, and hold it in your left hand. On condition that this second ball is red what is the probability that the ball thrown out of the window is blue?
  - (b) Then, with your right hand, pick a third. On condition that both the second and the third balls are red, what is the probability that the ball thrown out of the window is blue?
2. The life-time of an object has an exponential distribution. Approximately only 10 % of such objects live more than 5 years.
  - (a) How much is the expected value of these objects?
  - (b) What is the probability that such an object lives more than 6 years on condition that it lives more than 4 years?
3. The height of a randomly chosen man follows the normal distribution with an expected value of 180 cms and a standard deviation of 10 cms. The height of a randomly chosen woman follows the normal distribution with an expected value of 170 cms and a standard deviation of 5 cms. In a large group of people 25 % are men, 75 % are women.
  - (a) What is the probability that a randomly chosen person in that group is taller than 175 cms?
  - (b) What is the probability that a randomly chosen person is a woman on condition that the person is taller than 175 cms?
4. 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?
5.  $(X, Y)$  follows the distribution which has the density function  $f(x, y) = \frac{4}{x^4} (x > 1; 0 < y < \frac{1}{x})$ .
  - (a) Find the density function and expected value of  $X$ .
  - (b) Find the conditional density function of  $Y$  on condition that  $X = x$ .
6. Give the meaning of the the second moment of a continuous random variable
  - (a) by a correct(!) mathematical formula,
  - (b) in words, based on experimental results.

Standard normal distribution function  
(with 2 decimals)

$x$	$\Phi(x)$	$x$	$\Phi(x)$	$x$	$\Phi(x)$
0.0	0.50	1.0	0.84	2.0	0.98
0.1	0.54	1.1	0.86	2.1	0.98
0.2	0.58	1.2	0.88	2.2	0.99
0.3	0.62	1.3	0.90	2.3	0.99
0.4	0.66	1.4	0.92	2.4	0.99
0.5	0.69	1.5	0.93	2.5	0.99
0.6	0.73	1.6	0.95	2.6	1.00
0.7	0.76	1.7	0.96		
0.8	0.79	1.8	0.96		
0.9	0.82	1.9	0.97		