

## Exam: Mathematics 2

Hamburg University of Applied Science  
Faculty of Engineering & Computer Science, Department of Information and Electrical Engineering  
Prof. Dr. Robert Heß, January 26<sup>th</sup> 2018, duration: 90 Min.  
Permitted aids: up to six A4-pages of personal notes (i.e. single sided sheets)

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Result: ..... of 100 points                      Mark: ..... points.

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### **Problem 1 (20 points)**

Solve the following integral:  $\int \frac{6 - 4x}{x^3 - 6x^2 + 11x - 6} dx$

### **Problem 2 (10 points)**

Evaluate the gradient of the following function:  $f(x, y, z) = \sqrt{x^2 + y^2 - z^2}$

### **Problem 3 (28 points)**

For the differential equation  $y''' + 11y' = 6(y'' + y) + 5 \cos(x)$  find the general solution  $y(x)$ .

### **Problem 4 (12 points)**

For  $y(x) = ax^2 + bx + 1$  with  $a$  and  $b$  being parameters create the differential equation with  $y(x)$  as solution.

### **Problem 5 (15 points)**

For the probability density function  $f(x) = \begin{cases} 3x^2 & \text{for } 0 \leq x < 1 \\ 0 & \text{else} \end{cases}$  find expectation and variance.

### **Problem 6 (15 points)**

You are invited to a party for which Judy baked  $n_1$  biscuits of which  $s_1$  bear a surprise whereas John prepared  $n_2$  biscuits of which  $s_2$  contain a surprise.

- Taking a biscuit what is the probability that it has been baked by Judy?
- What is the probability that it has been baked by John?
- What is the probability to find a surprise?
- Once you found a surprise by which probability has it been provided by Judy?
- For  $n_1 = 120$ ,  $n_2 = 80$ ,  $s_1 = 10$  and  $s_2 = 8$  find the values for a) to d).