Surname: ..... Forename: ..... MatrNo.: .....

Exam: Mathematics 2

Hamburg University of Applied Science
Faculty of Engineering & Computer Science, Department of Information and Electrical Engineering
Prof. Dr. Robert Heß, June 30th 2017, duration: 90 Min.
Permitted aids: up to six A4-pages of personal notes (i.e. single sided sheets)

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

Problem 1 (30 points)

Solve the following integral: $\int \frac{6x^2 - 4x - 6}{x^3 - 7x + 6}\,\mathrm{d}x$

Problem 2 (12 points)

Create a parametric plot for $f(x,y) = \begin{cases} \mathbb{R}^2 \to \mathbb{R} \\ (x,y) \mapsto \exp(-xy) \end{cases}$ treating y as a parameter with $y = 0, \frac{1}{2}, 1, 2$ and $x \in [0,1]$.

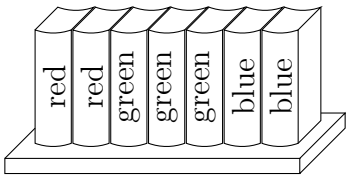
Problem 3 (25 points)

For the differential equation $y''' + 3y'' + y' + 5x = 5y$ find the general solution $y(x)$.

Problem 4 (10 points)

A circle with radius r around the origin of a Cartesian coordinate system may be described by $x^2 + y^2 = r^2$. With r as the parameter find the differential equation for $y(x)$.

Problem 5 (8 points)



You place two red, three green and two blue books on a shelf. Assuming equal coloured books are completely equal, how many options are there to order them?

Problem 6 (15 points)

A thermal resistor is specified for 20 °C to have a resistance $2.35\,\mathrm{k\Omega} \pm 30\,\Omega$. Investigating a large number of produced resistors of this type reveals for 20 °C a mean resistance of $2.34\,\mathrm{k\Omega}$ with a standard deviation of $10\,\Omega$. Assuming normal distribution, what is the expected failure rate? Show your conclusion mathematically.