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, 13.7.2015, 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 (25 points)

Solve the following integral: $\int \frac{x^2}{x^3 - 6x^2 + 11x - 6}\,\mathrm{d}x$

Problem 2 (15 points)

Derive the Jacobian matrix J for the function $f : \begin{cases} \mathbb{R}^3 \to \mathbb{R}^3 \\ (x, y, z) \mapsto (z\sin(x), x\,e^y, y^2 z^2) \end{cases}$

Problem 3 (25 points)

For the differential equation $y'' = 4(y - e^{-2x})$ find the general solution $y(x)$.

Problem 4 (10 points)

For $y(x) = a\,\sin(x) + b\,\cos(x)$ with a and b being parameters create the differential equation.

Problem 5 (10 points)

We assume a random variable X with expectation μ_X, variance σ_X^2 and standard deviation σ_X with an unknown distribution. Summing up a large number n of samples of this random variable ...

a) ... what kind of distribution do we expect for this sum?

b) ... what is the expextation μ_n, variance σ_n^2 and standard deviation σ_n of this sum?

Problem 6 (15 points)

Peter, Paul and John share nine different fruits among them. Peter (the oldest) gets four, Paul gets three and John (the youngest) gets two fruits. How many options are there to share the fruits among them? Explain your Ansatz.