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

Exam: Mathematics 2/Calculus 2

Hamburg University of Applied Science
Faculty of Engineering & Computer Science, Department of Information and Electrical Engineering
Prof. Dr. Robert Heß, 9.7.2014, duration: 90 Min.

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

Problem 1 (20 points)

Solve the following integral: $\int \frac{x}{x^2+8x+16}\,\mathrm{d}x$

Problem 2 (15 points)

For the function $f: \begin{cases} \mathbb{R}^2 \to \mathbb{R}^2 \\ (x,y) \mapsto (-y,-x) \end{cases}$ sketch the vector plot in the range of $x, y \in [-2,2]$.

Problem 3 (20 points)

For the differential equation $y'' + 2y = 3(y' + e^x)$ find the general solution $y(x)$.

Problem 4 (10 points)

For $y(t) = \hat{u}\, e^{\omega t}$ with $\hat{u}$ and ω being parameter create the differential equation.

Problem 5 (20 points)

For the probability density function $f(x) = \begin{cases} \frac{3}{4}(1-x^2) & \text{for } |x| < 1 \\ 0 & \text{otherwise} \end{cases}$
evaluate expectation, variance and standard deviation.

Problem 6 (15 points)

Three (independent) resistors in series connection are fed with a current of 1 mA. The voltages at the resistors are 5, 10 and 40 V with noise (standard deviation) 20, 30 and 60 μV, respectively. Treating the total voltage U_{tot} as a random variable, evaluate expectation, variance and standard deviation.