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

Exam: Calculus 2

Hamburg University of Applied Science
Faculty of Engineering & Computer Science, Department of Information and Electrical Engineering
Prof. Dr. Robert Heß, 24.1.2014, duration: 90 Min.

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

Problem 1 (15 points)

Solve the following integral for $x \in \mathbb{R}_{>0}$: $\int \frac{3\sqrt{x} + \cos(x)}{2\sqrt{x^3} + \sin(x)} \, \mathrm{d}x$

Problem 2 (15 points)

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

Problem 3 (20 points)

For the differential equation $y'' = 4y' - 3y + e^{3x}$ find the general solution for $y(x)$.

Problem 4 (15 points)

For the function $y(x) = a\,x^2 + b\,x$ create a differential equation.

Problem 5 (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 6 (20 points)

A random variable X has the following probability mass function:

$$f(x) = \begin{cases} 3x^2 & \text{for } 0 < x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Find expectation and variance of X.