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, February 24th 2022, 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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I hereby apply to participate in the examination in Mathematics 2 at February 24th 2022.

I feel healthy and fit for the examination. All the preconditions for the examination are fulfilled.

I know that anyone who has symptoms of illness which have have not been clarified by medical staff is not allowed to enter the premises of the HAW Hamburg. I hereby confirm that I do not show any symptoms.

February 24th 2022

.....
signature

### Problem 1 (10 points)

Solve the following integral: $\int \sin(x) e^{\cos(x)} \, \mathrm{d}x$

### Problem 2 (15 points)

Draw a vector plot of the function $\boldsymbol{f}(x, y) = (y, x)$ for $x, y \in \{-2, -1, 0, 1, 2\}$

### Problem 3 (15 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 4 (25 points)

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

### Problem 5 (20 points)

The power absorption of light bulbs is specified with 10 W with a tolerance of $\pm 10\,\%$. After producing a large number you discover $0.82\,\%$ absorbing too much power and another $0.82\,\%$ absorbing too little power. Assuming normal distribution what is the standard deviation of power absorption?

### Problem 6 (15 points)

At weekdays noon a server detects on average 12 requests per second for a given web page. Treating the number of requests per second as a random variable $X$ ...

a) what kind of random distribution do you expect?

b) find the probability mass function of $X$.

c) find expectation, variance an standard deviation of $X$.