Fachbereich Mathematik der Universität Hamburg **SoSe 2024**
Prof. Dr. J. Struckmeier,
Dr. H. P. Kiani, T. Hassan

Complex functions for Engineering Students

Sheet 7 (Homework)

Exercise 1:

Determine and classify all isolated singularities of the following functions.

a) $f(z) = z^3 \cdot \sinh(\frac{1}{z})\,,$

b) $f(z) = \dfrac{\sin(z) - z}{z^2(\frac{\pi^2}{4} - z^2)}\,,$

c) $f(z) = \dfrac{\ln(z)}{(z-1)^4}, \qquad z \in \mathbb{C} \setminus (-\infty, 0]\ .$

Exercise 2:

Calculate the following integrals or their (Cauchy) principal values with the use of the residue (see lecture notes pages 149-151).

a) $\displaystyle\int_0^\infty \frac{1}{x^4+16}\,dx.$

b) $\displaystyle\int_{-\infty}^\infty \frac{x\cos(\omega x)}{x^2+4}\,dx \qquad \omega > 0.$

c) $\displaystyle\int_{-\infty}^\infty \frac{x\sin(\omega x)}{x^2+4}\,dx \qquad \omega > 0.$

Submission Deadlines: 08.07.24 - 12.07.24