Fachbereich Mathematik der Universität Hamburg **SoSe 2023**
Prof. Dr. J. Struckmeier
Dr. K. Rothe, E. Ficola

Complex functions for Engineering Students

Homework 7

Exercise 1:

Determine the Laurent the Laurent development of the following functions and specify in each case the coefficients a_{-1} of the series:

a) $f(z) = \dfrac{\exp(z-2)}{z-2}$ at point $z_0 = 2\,,$

b) $f(z) = z^2 \cosh\left(\dfrac{1}{z+1}\right)$ at point $z_0 = -1\,,$

c) $f(z) = \dfrac{z - \sin z}{z^7}$ at point $z_0 = 0\,.$

Exercise 2:

Compute the following integrals using the residual calculus

a) $\displaystyle\int_0^\infty \frac{1}{x^{5/2} + 13x^{3/2} + 36x^{1/2}}\, dx\,,$

b) $\displaystyle\int_0^{2\pi} \frac{1}{2 + \cos x}\, dx\,,$

c) $\displaystyle\int_{-\infty}^{\infty} \frac{1}{x^4 + 10x^2 + 9}\, dx\,,$

d) $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(3x)}{x^2 - 6x + 10}\, dx\,.$

Hand in until: 7.7.