

Complex functions for Engineering Students

Work Sheet 7

Exercise 1:

- a) Determine and classify all isolated singularities for the given functions.

$$f(z) = \frac{2z^3 + 3z^2 + 2z + 1}{z^3 + z^4}, \quad g(z) = \frac{1}{(z-1)(z-2)(z-3)(z-4)},$$

$$h(z) = \frac{1}{z^2 + 2z + 2} \quad \text{und} \quad s(z) = \frac{\sin(z)}{z(z^2 + 1)}.$$

- b) Calculate the residues for all isolated singularities from part a).

Exercise 2:

f, s, h are the functions from exercise 1.

- a) Determine the complex partial fraction of h .
- b) Calculate the following integrals (using the residue theorem)

$$\int_{|z|=\pi/2} f(z) dz,$$

$$\int_{|z|=2} h(z) dz, \quad \int_{-\infty}^{\infty} h(z) dz,$$

$$\int_{|z|=1/2} s(z) dz, \quad \int_{|z-i|=1/2} s(z) dz.$$

The circles are to be traversed once (positively).

Class: 08.07.24