

Complex Functions for Students of Engineering Sciences Worksheet 7

Problem 1. Consider the functions

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

- (a) Determine and classify all isolated singularities of f and g , respectively.
- (b) Compute the corresponding residues.
- (c) Find a partial fraction decomposition for f and g , respectively.
- (d) Compute $\oint_{\Gamma} f(z) \, dz$ and $\oint_{\Gamma} g(z) \, dz$ for $\Gamma = \partial B_2(i/2)$.

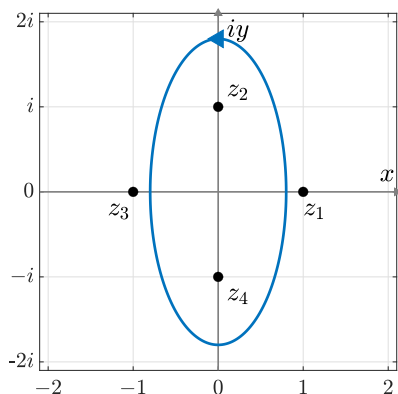
Problem 2. Compute

$$\int_{-\infty}^{\infty} \frac{1}{(x^2 + 1)(x^2 + 4)} \, dx.$$

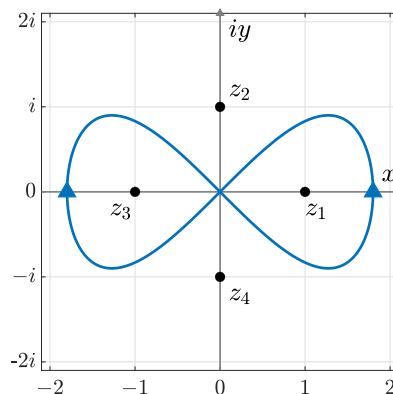
Problem 3. Compute $\int_{\Gamma} \frac{z^2}{(z^2 + 1)(z^2 - 1)} dz$ for the depicted curves Γ .

The arrows show the direction of the curve and we assume that each curve is passed through once.

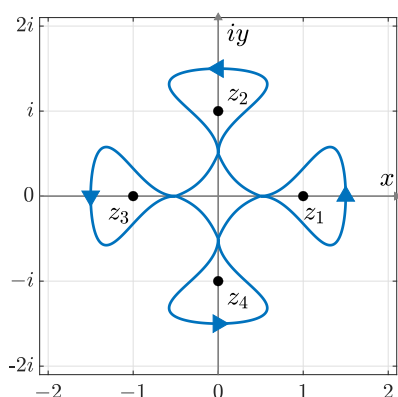
(a)



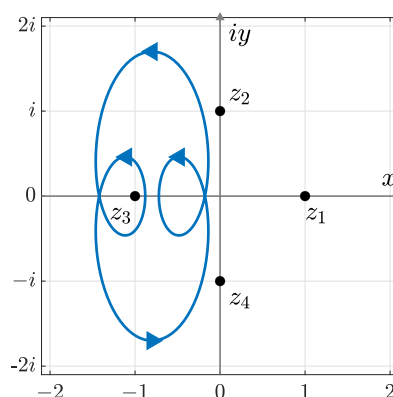
(b)



(c)



(d)



(e)

