

1. Compute the following integrals. The contour of integration can be any curve that joins the two points.

$$(a) \int_i^{i/2} e^{\pi z} dz, \quad (b) \int_0^{\pi+2i} \cos \frac{z}{2} dz, \quad (c) \int_1^3 (z-2)^3 dz.$$

2. Let  $C$  be a simple closed curve that does not go through the point  $z_0$ . If  $n \in \mathbb{Z} \setminus \{0\}$  show that

$$\oint_C (z - z_0)^{n-1} dz = 0.$$

What happens if  $n = 0$ ?

3. Let  $C$  be the circle with center at 0 and radius 1/2, positively oriented. Compute

$$\oint_C \frac{dz}{z(z-1)}.$$

*Hint:*  $\frac{1}{z(z-1)} = \frac{1}{z-1} - \frac{1}{z}$ .

4. Let  $C$  be the unit circle, positively oriented. For each of the following functions compute

$$\oint_C f(z) dz.$$

$$f(z) = \frac{z^2}{z+3}, \quad ze^{-z}, \quad \frac{1}{z^2+2z+2}, \quad \tan z, \quad \text{Log}(z+2).$$