1. Compute the Laurent series for \( f(z) = \frac{z+1}{z^2(z^2+1)} \) on the region \( A : 0 < |z| < 1 \) centered at \( z = 0 \).

\textbf{Ans:} See Example 7.22 in the notes.

2. Find the Laurent series around \( z = 0 \) for \( f(z) = \frac{1}{z(z-1)} \) in each of the following regions:
   2.1. The region \( A_1 : 0 < |z| < 1 \)
   2.2. The region \( A_2 : 1 < |z| < \infty \).

\textbf{Ans:} See Example 7.23 in the notes.

3. Suppose \( f(z) \) is an analytic function on the unit disk such that \( f(w) = 5 \) for all \( w \in \{x + i0 : -0.2 \leq x \leq 0.2\} \). What is \( f(i/2) \)? Does your answer change if instead the assumption is that \( f(w) = 5 \) for all \( w \in \{x - 3i/4 : -0.2 \leq x \leq 0.2\} \)?

\textbf{Ans:} Consider the function \( g(z) = f(z) - 5 \), which is analytic on the unit disk. Since \( g(z) \) has a non-isolated zero at the point 0, it follows that \( g \) must be identically equal to 0. In particular, \( 0 = g(i/2) = f(i/2) - 5 \), so that \( f(i/2) = 5 \).

4. Find a power series solution to the differential equation \( f'(x) = f(x) + 2 \) with \( f(0) = 0 \).

\textbf{Ans:} See Example 7.24 in the notes.