1. Find all singular points of the following functions and classify them:
   a) \( \cot z - \frac{1}{z} \)
   b) \( \sin \left( \exp \frac{1}{z} \right) \)
   c) \( \frac{1}{z^2 - 1} \cos \frac{\pi z}{z + 1} \)

2. Find the Laurent expansion of

\[
\frac{1}{(z - 1)^2(z + 2)}
\]

in the annulus \( 1 < |z| < 2 \).

3. Evaluate the residue

\[ \text{Res}_{\infty} \ln \frac{z - 1}{z + 1} \]

for each branch of this function which is defined in a neighborhood of \( \infty \).

4. Find a conformal map of the following region onto the upper half-plane:

(horizontal strip of width \( 2\pi \), symmetric with respect to \( \mathbb{R} \), from which the positive ray is removed).

5. For all real \( t \) evaluate the integral

\[
\int_{1-i\infty}^{1+i\infty} \frac{e^{tz}}{z^2 + 1} \, dz
\]

(the path of integration is the vertical line \( \{ z : \text{Re} \, z = 1 \} \)).

6. Show that the series

\[
\sum_{n=0}^{\infty} \frac{\cos nz}{n!}
\]

is uniformly convergent on every compact in \( \mathbb{C} \).