1. Suppose \( f(z) \) is entire. Prove that \( \overline{f(\overline{z})} \) is entire.

2. Find an analytic function \( f(z) = f(x + iy) \) such that \( u(x, y) = \text{Re} f(z) = xy \). Express \( f \) as a function of \( z \).

3. Consider the map \( f(z) = 1/z \). Determine the image of the line \( \text{Im} \, z = 1 \). Sketch. Explain.

4. Consider the power series
\[
\sum_{n=1}^{\infty} z^n.
\]
(a) Find the radius of convergence.
(b) Prove that convergence is uniform in any disk centered at the origin with radius smaller than the radius of convergence.

5. (a) Find a parametrization for the straight line segment from 0 to \( 5 - 2i \).
(b) Integrate \( \text{Im} \, z \) along this segment.

6. Calculate the following curve integrals:
(a) \( \int_{\gamma} \frac{dz}{z^2 + 4} \), where \( \gamma \) is circle of radius 5 centered at 0.

(b) \( \int_{\gamma} \frac{\cos z \, dz}{z^3} \), where \( \gamma \) is:

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