

1. Prove that the series

$$\sum_{n=0}^{\infty} z^n,$$

converges to the function  $f(z) = \frac{1}{1-z}$  for all  $z$  with  $|z| < 1$  and does not converge for any other  $z \in \mathbb{C}$ .

Prove also that the convergence is uniform in every domain  $D = \{|z| \leq r\}$  with  $r < 1$ .

Prove that the convergence is not uniform in the domain  $\{z : |z| < 1\}$ .