COMPLEX ANALYSIS, HW # 4

Chapter 4, problems 3, 4, 5; Chapter 11, problems 5, 11, 15, and this problem:

Problem 1.

Prove that there is no entire analytic function such that

$$\bigcup_{n=0}^{\infty} \left\{ z \in \mathbb{C} \,:\, f^{(n)}(z) = 0 \right\} = \mathbb{R}.$$