1. (10 pts.) Prove the first part of the Weierstrass theorem: Suppose Ω is a domain in the complex plane and \( f_n \) is a sequence in \( H(Ω) \) such that \( f_n \to f \) uniformly on compact subsets of Ω. Prove that \( f \in H(Ω) \).

2. (10 pts.) Find the first three nontrivial terms of the Laurent series at the origin of
(a) \( f(z) = e^z \sin(3z^2) \)
(b) \( f(z) = 1/\sin(z) \)

3. (10 pts.) Prove that a nonconstant entire function must have a dense image.

4. (10 pts.) Let \( \mathbb{C}^* = \mathbb{C} \setminus \{0\} \). For each of the following covering maps \( p \), how many elements are there in each stalk \( p^{-1}(x) \)? Compute and sketch \( p^{-1}(i) \). Illustrate that \( p \) is indeed a covering map by sketching an evenly covered neighborhood of \( i \) and its preimage under \( p \).
(a) \( p(z) = z^2 : \mathbb{C}^* \to \mathbb{C}^* \)
(b) \( p(z) = e^z : \mathbb{C} \to \mathbb{C}^* \)