1. Let $f$ be an entire function and suppose $|f(z)| \leq M|z|$ for every $z \in \mathbb{C}$. Show that $f(z) = cz$ for some constant $c \in \mathbb{C}$ and all $z \in \mathbb{C}$.

2. Show that there is no power series $f(z) = \sum_{n=0}^{\infty} c_n z^n$ such that
   (i) $f(z) = 1$ for $z = 1/2, 1/3, \ldots, 1/n, \ldots$
   (ii) $f'(0) > 0$

3. Show that if $f : \mathbb{C} \to \mathbb{C}$ is a continuous function such that $f$ is known to be analytic on the complement of the interval $[-1, 1]$, then in fact $f$ is an entire function.

4. Show that if $f$ and $g$ are analytic on a domain $D$ and if $fg$ is also analytic, then either $f$ is a constant, or $g$ is identically zero.