1. Compute \( \int_{|z|=R} \frac{1}{(z-a)^{n+1}(z-b)^{m+1}} \, dz \) for \( a \) and \( b \) complex constants such that \( |a| \neq R \) and \( |b| \neq R \). (There are four cases to consider.)

2. Compute \( \int_{|z|=3} \frac{e^{z^2}}{(z-1)} \, dz \)

3. Compute \( \int_{|z|=3} \frac{e^z}{(z^2+1)} \, dz \)

4. Compute \( \int_{|z-1|=\sqrt{2}} \frac{\sin(z)}{(z^3+z)} \, dz \)

5. Compute \( \int_{|z|=R} \frac{e^z}{z^n} \, dz \)

6. Suppose \( f(z) \) is entire and for some \( n \) that \( |f(z)| \leq |z|^n \) for \( |z| \geq n^2 \). Show that \( f(z) \) must be a polynomial.