1. Show that
\[ \int_0^{2\pi} e^{it} dt = 2\pi \quad \text{and} \quad \int_{-\pi}^{\pi} e^{\cos t} \cos(sint) dt = 2\pi. \]

2. Let \( a \) be a real number with \( a > 1 \) and \( n \) is an integer. Using the mean value theorem for \( f(z) = 1/(z^n + a) \) to show that
\[ \int_{-\pi}^{\pi} \frac{a + \cos(na)}{a^2 + 1 + 2a \cos(nt)} dt = \frac{2\pi}{a}. \]

3. Let \( f \) be a nonconstant analytic function in a bounded domain \( \Omega \). Assume that \( f \) is continuous and nonzero on the closure of \( \Omega \). Show that minimum value of \( |f(z)| \) can only achieved on the boundary of \( \Omega \).

4. The Wallis formula for even integers.
   a) Using the binomial theorem to verify that
   \[ z^{-1} \left( z + \frac{1}{z} \right)^{2n} = \sum_{k=0}^{2n} \frac{(2n)!}{(2n-k)!k!} z^{2n-2k-1}. \]
   b) Using Cauchy’s theorem to show that
   \[ \int_{|z|=1} z^{-1} \left( z + \frac{1}{z} \right)^{2n} dz = \frac{2\pi i (2n)!}{(n!)^2}. \]
   c) Conclude that
   \[ \int_0^{2\pi} \cos^{2n}(t) dt = 2\pi \frac{(2n)!}{2^{2n}(n!)^2}. \]

More later!