Study Guide: Complex Variables

1. Calculating \( a^b \). \( n^{\text{th}} \) roots.

2. Absolute value. Unit circle. Circles. \( e^z \) never vanishes.


4. Harmonic functions. \( u = \text{Re} \, f \). Harmonic conjugate.


6. Taylor expansion. \( a_n = \frac{1}{2\pi i} \int_C \frac{f(z)}{(z - z_0)^{n+1}} \, dz \). Maclaurin expansion.


8. Integrals of the form \( \int_C f(z) \, dz \) or \( \int_C \frac{f(z)}{g(z)} \, dz \).

9. Using residues to calculate \( \int_{-\infty}^{\infty} f(x) \, dx \).

10. Integrals of the form \( \int_C \frac{f''(z)}{f(z)} \, dz \). Winding number. Argument principle. Rouché’s Theorem.

11. Mapping by FLT’s: \( M, T, R, K \) mappings. \( K \) maps UHP to the unit disk.