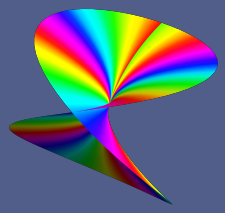
UC RIVERSIDE
UNIVERSITY OF CALIFORNIA
Department of Mathematics

MATH 165B - Introduction to Complex Variables

Final Exam Topics



Worksheets 1 through 14

1. **Local behavior**
   - (a) Isolated Singular Points
   - (b) Residues
   - (c) Cauchy's Residue Theorem
   - (d) Classification of singular points
   - (e) Residues at poles
   - (f) Zeros of Analytic Functions
   - (g) Zeros and Poles
   - (h) Behavior of Functions near Isolated Singular Points
2. **Applications of Residues**
   - (a) Example of Evaluating Improper Integrals Using the Residue Theorem
   - (b) Argument Principle
   - (c) Rouche's Theorem
3. **Mapping by Elementary Functions**
   - (a) Linear Transformations
   - (b) The transformation $T(z) = \dfrac{1}{z}$
   - (c) Linear Fractional Transformations (also known as Möbius Transformations
     - i. Definition
     - ii. Cross-ratios
   - (d) The Transformation $w = \sin z$
   - (e) Mappings by z^2 and Branches of $z^{1/2}$
4. **Conformal Mappings**
   - (a) Preservation of angles
   - (b) Scale factors
   - (c) Local inverses
   - (d) Harmonic conjugates

5. **Applications of Conformal Mappings**

   (a) Transformations of conformal mappings

   (b) Transformations of boundary conditions

   (c) Two Dimensional Mathematical Models: Orthogonal Families of Level Curves

   (d) Steady State Temperatures: Isothermals

   (e) Steady State Temperatures: Examples of Neumann Problems