

# Chapter V. Singularities

## Study Guide

The following is a brief list of topics covered in Chapter V of Conway's *Functions of One Complex Variable*, 2nd edition. This list is not meant to be comprehensive, but only gives a list of several important topics. You should also carefully study the proofs given in class and the homework problems.

### V.1. Classification of Singularities.

Isolated singularity, removable singularity, classification of removable singularity (Theorem V.1.2), pole, essential singularity, expression of a function with a pole (Proposition V.1.4), pole of order  $m$ , simple pole, singular part of  $f$  at pole  $a$ , absolutely convergent series, uniform convergence, Laurent Series Development (Theorem V.1.11), classification of singularities in terms of Laurent series coefficients (Corollary V.1.18), Casorati-Weierstrass Theorem (Theorem V.1.21), Great Picard Theorem, Little Picard Theorem.

### Section V.2. Residues.

Residue of  $f$  at  $a$ , the Residue Theorem (Theorem V.2.2), computing residues (Proposition V.2.4), computing integrals.

### Section V.3. The Argument Principle.

Meromorphic function, the Argument Principle (Theorem V.3.4), integrals in terms of function values (Theorem V.3.6 and Proposition V.3.7), Rouché's Theorem (Theorem V.3.8) and Ahlfors's version, proof of the Fundamental Theorem of Algebra using Rouché's Theorem.

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