

# Chapter 6. Residues and Poles

## Study Guide

The following is a brief list of topics covered in Chapter 6 of Brown and Churchill's *Complex Variables and Applications*, 8th edition. This list is not meant to be comprehensive, but only gives a list of several important topics. You should also carefully study the examples and proofs given in class and in the homework problems.

### **Section 6.68. Isolated Singular Points.**

Isolated singularity, examples.

### **Section 6.69. Residues.**

Residue, the relationship of a residue to an integral (Note 6.69.A), examples.

### **Section 6.70. Cauchy's Residue Theorem.**

Cauchy's Residue Theorem, example.

### **Section 6.71. Residues at Infinity.**

Isolated singular point at  $\infty$ , residue at infinity, integrals related to residues at  $\infty$  (Theorem 6.71.1), example.

### **Section 6.72. The Three Types of Isolated Singular Points.**

Pole of order  $m$ , simple pole, removable singular point, "removing" a removable singularity (Note 6.72.A), essential singular point, examples, Picard's Theorem.

### **Section 6.73. Residues at Poles.**

Classification of functions with poles of order  $m$  (Theorem 6.73.1).

### **Section 6.74. Examples.**

Examples illustrating Theorem 6.73.1.

### **Section 6.75. Zeros of Analytic Functions.**

Zero of order  $m$ , factoring functions with zeros of order  $m$  (Theorem 6.75.1), zeros of analytic functions are isolated (Theorem 6.75.2), analytic function identically equal to 0 (Theorem 6.75.3).

### **Section 6.76. Zeros and Poles.**

Poles of quotients of analytic functions (Theorem 6.76.1), residues of quotients of analytic functions, examples.

**Section 6.77. Behavior of Functions Near Isolated Singular Points.**

Limits at a pole (Theorem 6.77.1), behavior in a deleted neighborhood of a removable singular point, Riemann's Theorem (Lemma 6.77.1), Casorati-Weierstrass Theorem (Theorem 6.77.3).

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