

## MATH 427: COMPLEX ANALYSIS (SUMMER 2018)

### MIDTERM STUDY TOPICS

**Section 1.1:** Properties of  $\mathbb{C}$ : multiplication, inverse, conjugation, modulus and triangle inequality, Theorem 1.1.7.

**Section 1.2:** Definition of convergence, radius of convergence for simple series, simple examples.

**Section 1.3:** Definition and properties of the function  $e^z$ , for example Theorems 1.3.2, 1.3.4, 1.3.6, 1.3.7. Definition 1.3.8 for  $\sin z, \cos z$ .

**Section 1.4:** The polar form, and using it to find powers, roots, and logarithms. The multi-valued function  $\arg(z), \log(z)$  and their basic properties (e.g. Theorem 1.4.8). Know the branches of  $\arg(z), \log(z)$ , especially the principal branch, and know how to find the cut-line for given branches.

**Section 2.1:** Know open and closed sets; Be able to use the  $\epsilon, \delta$  definition of continuous functions.

**Section 2.2:** Definition of complex derivative, Theorems 2.2.6 and 2.2.7. Know how to set up functions in  $u + iv$  form and apply the Cauchy-Riemann equations.

**Section 2.3:** Contour integrals. Be able to use Definition 2.3.8 to write them explicitly.

**Section 2.4:** Know how to parametrize line segments  $[z_0, z_1]$  and circles (and semi-circles). Length of a path and Theorem 2.4.9.

**Section 2.5:** Know the statements of Theorems 2.5.6 (antiderivative), 2.5.8 (Cauchy Theorem for triangle).

**Section 2.6:** Know the first two subsections: Existence of anti-derivatives on open convex sets, Theorem 2.6.1, and Cauchy theorem for convex sets, Theorem 2.6.2.