

From Cauchy's Theorem On

Summary. *In a sense this course has only one theorem, $\int_{\partial R} f(z)dz = 0$. The derivation of everything else starting there is very rapid. This document records the order of the main ideas.*

Fundamental Theorem of Calculus on \mathbb{R}

Green's Formula in \mathbb{R}^2

$$\int_{\partial R} f(z)dz = 0$$

Antiderivatives on Simply Connected sets

$$f(z) = \frac{1}{2\pi i} \int_{\partial R} \frac{f(\zeta)}{\zeta - z} dz, \quad f^{(n)}(z) = \frac{1}{2\pi i} \int_{\partial R} \frac{n! f(\zeta)}{(\zeta - z)^{n+1}} dz$$

Infinite differentiability

Cauchy inequalities

Liouville Theorem, Fundamental Theorem of Algebra

Mean Value Theorem

Maximum Modulus Theorem

Power series representation

Unique continuation

Laurent series

Partial fractions

Fourier series

Residue Theorem

Evaluation of integrals