INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH KOLKATA

MA 4101: Complex Analysis
Duration: 1 hour

Mid-semester Exam
Date : September 17, 2018

Total Marks: 20

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1. *Consider the map $f : \mathbb{D} \to \mathbb{C}$ defined by*

$$f(z) = \frac{(z+1)^2}{(z-1)^2}.$$

   i) *Is f holomorphic and $f(\mathbb{D}) = \mathbb{C}$? Justify*
   ii) *Is f a injective map onto its range? Justify*
   iii) *What is the largest domain $\Omega \subset \mathbb{D}$ such that $\log f$ is holomorphic? Justify*
   iv) *On which domain does f^{-1} exist and holomorphic? Justify.*

(4 × 5 = 20 marks)

Note: You can use well-known theorems taught in the class, but you need to write precise statement of the theorem that you are using.