Queen Mary
University of London

Main Examination period 2022 – May/June – Semester B

MTH4000: Module Name

Examiners: F. Examiner, S. Examiner

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Question 2 [25 marks].

(a) Define what it means for a function to be **analytic** on some open subset of $\mathbb{C}$. [**5**]

Let s be a complex number such that $\Re(s) > 1$. Define $\zeta(s)$ to be the number:

$$\zeta(s) := \sum_{n=1}^{\infty} n^{-s}.$$

(In all cases, n^{-s} means $\exp(-s \log n)$, with $\log n \in \mathbb{R}$.)

(b) State how to define the analytic continuation of ζ to all of $\mathbb{C} \setminus \{1\}$. [**10**]

(c) Show that all non-real zeros of this analytic continuation have real part equal to $\frac{1}{2}$. [**10**]

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