

Instructions

1. Print your name and UWaterloo ID number at the top of this page, and on no other page.
2. Check for questions on both sides of each page.
3. Answer the questions in the spaces provided. If you require additional space to answer a question, please use one of the overflow pages, and refer the grader to the overflow page from the original page by giving its page number.
4. Do not write on the Crowdmark QR code at the top of each page.
5. Use a dark pencil or pen for your work.
6. All questions are equally weighted.

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1. How many roots (counted with multiplicities) does $f(z) = z^6 + 8z^4 + 1$ have inside $|z| = 1$? Show the details.

Extra page for answers. Please specify the question number here and the use of this page on the question page.

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2. (a) Show that there do not exist holomorphic functions $f : \mathbb{C} \setminus \{0\} \rightarrow \mathbb{C}$ with $\operatorname{Re}(f(z)) = \log |z|$.
- (b) Let f be an entire function such that $|f(z)| \leq \log |z|$ for $|z|$ large. Show that f is a constant function.

Extra page for answers. Please specify the question number here and the use of this page on the question page.

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3. Find $\int_0^\infty \frac{\sin x}{x} dx$. Show the details.

Extra page for answers. Please specify the question number here and the use of this page on the question page.

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