MATH 3379.001 Complex Variables

HW 5; Fall 2023

Due: 09/26, Tuesday, 11:59 pm

Textbook Recommended Problems (Do not turn in): Page 71: 4, 8; Page 76: 1, 2, 5, 6

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1. Verify that the following functions are differentiable and find the derivatives.
   (a) $f(z) = iz - 2$
   (b) $f(z) = e^{-z}$
2. Determine the set in which $f(z)$ is differentiable and find $f'(z)$.
   (a) $f(z) = z\,\mathrm{Im}(z)$
   (b) $f(z) = x^2 + iy^2$
   (c) $f(z) = \dfrac{1}{z}$
3. Verify that the following functions are entire.
   (a) $f(z) = (3x + y) + i(3y - x)$
   (b) $f(z) = \sin x \cosh y + i \cos x \sinh y$
4. Verify that the following functions are nowhere analytic
   (a) $f(z) = xy + iy$
   (b) $f(z) = e^{i\overline{z}}$
5. If $f(z) = u(x, y)$ (real valued) and analytic in a domain D, prove that $f(z)$ must be constant throughout D.