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Peer-graded Assignment: Peer Graded Assignment #2

Submit by May 5, 11:59 PM PDT

Important Information
It is especially important to submit this assignment before the deadline, May 5, 11:59 PM PDT, because it must be graded by others. If you submit late, there may not be enough classmates around to review your work. This makes it difficult - and in some cases, impossible - to produce a grade. Submit on time to avoid these risks.

Instructions

My submission

Discussions

Give your project a descriptive title

PROBLEM 1

Find the image of the set $U = \left\{ z \in \mathbb{C} \mid \frac{-\pi}{2} < \operatorname{Re} z < \frac{\pi}{2} \right\}$ under the function $f(z) = \sin z$.

To do so, please answer the following questions:

1. What is the image of the line segment $L_1 = \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (on the real axis) under f?
2. What is the image of the imaginary axis $L_2 = \{iy \mid y \in \mathbb{R}\}$ under f?
3. What is the image of the vertical line $L_3 = \left\{ -\frac{\pi}{2} + iy \mid y \in \mathbb{R} \right\}$ under f?
4. What is the image of the vertical line $L_4 = \left\{ \frac{\pi}{2} + iy \mid y \in \mathbb{R} \right\}$ under f?
5. Given your above observations, what do you guess the image of the set U is under f?

You do not need to submit a graph for this problem, but it may help you to make a sketch of all of the sets involved. Please answer all of the given parts (a)-(e).

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PROBLEM 2

Let $u(x,y) = x^2 - y^2 - y$. Find a real-valued function $v(x,y)$ such that $v(0,0) = 1$ and together, u and v satisfy the Cauchy-Riemann equations in the entire complex plane.

To do so, please follow these steps:

1. Find the partial derivatives $u_x(x,y)$ and $u_y(x,y)$.
2. Using these partial derivatives and the Cauchy-Riemann equations, give equations for the partial derivatives $v_x(x,y)$ and $v_y(x,y)$.
3. Find functions $v(x,y)$ that satisfy the equation for the partial derivative with respect to x.
4. Find functions $v(x,y)$ that satisfy the equation for the partial derivative with respect to y.
5. Now find a function $v(x,y)$ that satisfies both equations for the partial derivatives at the same time.
6. Finally, check whether the function you found in the previous step satisfies $v(0,0) = 1$. If not, modify the function so that it does.

Be sure to include all of these steps (labeled (a)-(f) as above) in your submission.

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