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Problem 4.10

0.0/2.0 points (ungraded)

Consider the multi--valued function f(z) defined as a solution to the following equation

$$f(z)^{2}-2f(z)+z^{2}=0.$$

Show that the function $f\left(z
ight)$ can be rendered single--valued by drawing a cut connecting z=-1 to z=1 along the real axis (consider a plane with such a cut in what follows). Consider now the multi--valued function g(z) which is a composition of two other multi--valued functions, $\ln z$ and f(z):

$$g(z) = \ln \left(1 + f(z)\right).$$

Determine the possible values of $g(\sqrt{5})$.

$$g_{\pm,n}(\sqrt{5}) = \pm i + in$$

 $\frac{1}{2} \ln 2$ $\frac{3}{2} \ln 2$ $\frac{3}{4} \ln 2$ $\pi/2$ $\pi/4$ 2π

Which of the following are the branch points?

Check all of the options below that correspond to branch points of the respective branches.

 $ceil g_{+,n}\left(1
ight)$

 $]g_{-,n}\left(1
ight)$

 $]g_{+,n}\left(\infty
ight)$

 $brack g_{-,n}\left(\infty
ight)$

 $igcup g_{+,n} \ (i\sqrt{3})$

 $\bigcap g_{-,n}\ (i\sqrt{3})$

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You have used 0 of 6 attempts