Problem 4.10

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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 $f(z)$ 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 $f(z)$:

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

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

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

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

Which of the following are the branch points?

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

- [ ] $g_{+,n}(1)$
- [ ] $g_{-,n}(1)$
- [ ] $g_{+,n}(\infty)$
- [ ] $g_{-,n}(\infty)$
- [ ] $g_{+,n}(i\sqrt{3})$
- [ ] $g_{-,n}(i\sqrt{3})$

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