Problem 4.8

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Homework due Nov 14, 2020 19:00 EST

Problem 4.8

0.0/2.0 points (graded)

The point z_0 is called a branch point for the complex (multiple) valued function $f(z)$ if the value of $f(z)$ does not return to its initial value as a closed curve around the point is traced (starting from some arbitrary point on the curve), in such away that f varies continuously as the path is traced. It is possible and sometimes useful to generalize this definition to the point $z = \infty$. The simplest way to do so is to first map $z = \infty$ into a point on the finite complex plane and then apply to it the prior definition. This we can do using the inversion map: by introducing the new variable $\zeta = 1/z$ and then applying a prior definition at $\zeta = 0$. Consider the following example.

Check all of the options below that correspond to the functions that have branch points at $z = \infty$.

- [ ] $f(z) = \ln z$
- [ ] $f(z) = \ln\left(\frac{z-1}{z+1}\right)$
- [ ] $f(z) = \ln\left(z^2 - 1\right)$
- [ ] $f(z) = \sqrt{z^2 - 1}$

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