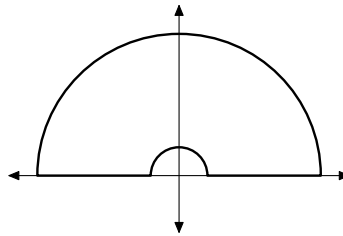


Math 113 Problem Set 8

Due Monday, November 10, 2003

1. (Adapted from Needham, Chapter 2, problem 24). Consider the multifunction $f(z) = \sqrt{z+1}\sqrt[3]{z-1}$.
 - (a) Where are the branch points and what are their orders?
 - (b) Why can't you choose a branch cut to run from one branch point to the other, as we did in class for $\sqrt{z^2-1}$?
 - (c) How many branches does $f(z)$ have at a typical point z ? Find and plot the possible values for $f(0)$.
 - (d) For each of the possible values w_i of $f(0)$ that you found, find a closed path P starting and ending at 0 so that following the analytic continuation of f around P , starting with $f(0) = w_0$, you return to $f(0) = w_i$.

2. Evaluate $\int_0^\infty \frac{\log x dx}{x^2+1}$. (Hint: consider integrating along a contour like the one below.)



3. Evaluate $\int_{-1}^1 \frac{dx}{(1-x)^p(1+x)^{(1-p)}}$, for $0 < p < 1$, by integrating along a contour like the inner contour indicated below. Note that the integral around the outer circle is not 0. You should start by showing that we may take a branch cut for this function to run between the points -1 and 1 (unlike what was the case in the first problem).

