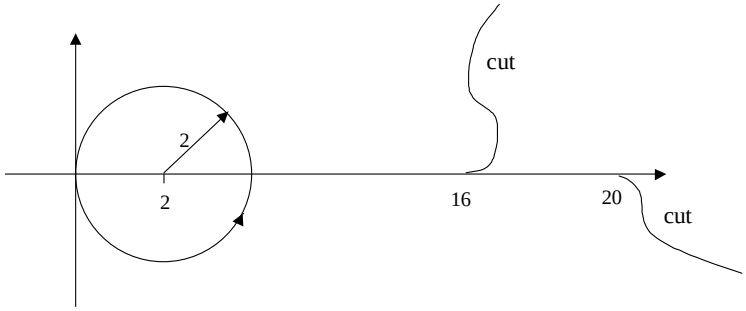
PHGN511 Homework #2

Due Monday, Sep. 10, 2004 at the beginning of class

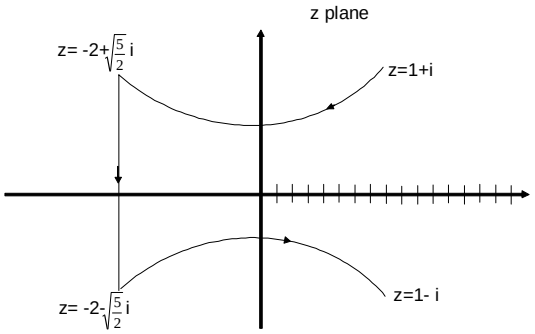
For some of the problems, the mathematica series and residue functions can help you verify your answers, but in this case, I want you to show all your work on all problems and just use mathematica for confirmation.

1) I gave this problem last year, so those of you who started the course last year have the solution. In spite of this, I think it's really instructive, so try to do it without looking at the solution if you have a copy. Given $f(z)=\frac{(z-16)^{\frac{1}{3}}(z-20)^{\frac{1}{2}}}{z-1}$ with f(24) = 4/23 and branch cuts as shown, compute the imaginary part of $\oint_C f(z)dz$ where contour C is the circle of radius 2 with center at z=2 as shown.



2) Butkov 2.26

3) This is a problem where a bit of thinking can save you alot of work. Find the value of the integral $\int_C \frac{dz}{z^{1/3}}$ where C is the path from z = 1+i to z = 1- i illustrated in the figure. Here $z^{1/3}$ is the branch such that $(-8)^{1/3}=2e^{i\frac{5\pi}{3}}$ and the cut is along the positive real axis. The top and the bottom of the path are the hyperbola $2y^2-x^2 = 1$, and the left hand side is the straight line x = -2.



4) Butkov 2.24 parts a, b, c, e, g, h

5) Butkov 2.28 (you will need to look back at some of the tests for convergence of series such as the integral test in your first year calculus book to do these)