105a Homework 2, due before Oct 15, 2017 at 8pm

1. Find the locations of the poles of $(z^3 \sinh z)^{-1}$; note that there are an infinite number of poles, and find their residues. Please write your solution as part of your mathematica notebook whether or not you use mathematica. Also, using Mathematica, verify that the function satisfies the Cauchy Riemann equations. Hint: recall that $\sinh z = (e^z - e^{-z})/2$. By the way (BTW), $\sin z = (e^{iz} - e^{-iz})/2i$.

2. Use Cauchy's theorem to compute $\oint_C dz(z^3 \sinh z)^{-1}$ where C is a square shaped loop: with lengths of size $\Delta x = \Delta y = 10$, centered at the origin.

3. Consider $D(t) \equiv \int_{-\infty}^{\infty} \frac{d\omega}{2\pi}(\omega^2 + \omega_0^2)^{-1} e^{-i\omega t}$. Evaluate $D(t)$ using Cauchy's theorem; treat $t > 0$ and $t < 0$ separately, and indicate in each case how the contour is closed.

4. Dubin 1.2.6.

5. Dubin 1.3.4.

6. Dubin 1.4.1

7. Dubin 1.4.10 for equation (iii) only.