PHY101 HW #4
Due Friday, 2/1/13 @ 5pm
Clever tricks for evaluating integrals

Reading

Read Sections 5-7 of Chapter 14 of Boas. Actually, this assignment will only use section 7 through the top of page 49. Principle values and the later material in section 7 will be on HW#5. This section contains a lot of material and a lot of important examples!

Problems

Our focus this week will be on evaluating residues and using the Residue Theorem to evaluate definite integrals. This is one of the big payoffs (very simple techniques for evaluating complicated integrals) for all the theory we've done up until this point.

This assignment mostly involves evaluating integrals. I have tried to assign several problems of each problem type. However, it's a good idea to do additional problems and also make sure you can look at an integral and map out a solution strategy (i.e. identify the problem type and a suitable contour). This material is a core element of the course, and will surely show up on the midterm which is coming up soon.

From Boas Chapter 14:

Section 6, page 686, Problems 16, 26, 29, 26', 35'
Note that the primed problems are contour integrals along $|z| = 3/2$ *as defined in the short note after problem 35.*

New problem: Using the residue theorem, evaluate the integral below where C circles the origin once in the counter-clockwise direction at $|z| = 2$.

$$\int_C \frac{e^z}{\cosh z} dz.$$

Section 7, page 699, Problems 8, 11, 20. Hint for problem 20: For real x, $\cos x = \text{Re}\, e^{ix}$. Also, note that e^{iz} is large for large negative imaginary z (i.e., for $z = iy$ with y large, real, and negative) but small for positive imaginary z (i.e., for $z = iy$ with y large, real, and positive).

Section 11, page 718, Problem 21, 24. Hint for problem 24: See above hint for problem 20, section 7.