MATH 425b ASSIGNMENT 4
SPRING 2009
Prof. Alexander
Due Monday March 2.

Rudin Chapter 8 #12abce, 13, 14, 15, 19; Chapter 9 #3, 4, 5

The midterm will cover Ch. 7 and 8, excluding the following sections of Ch. 8: The Exponential and Logarithmic Functions, The Trigonometric Functions, The Gamma Function. I suggest you try to do #12abce, 13, 14 before the midterm, as preparation. #15, 19 can wait until after the midterm.

HINTS:

GENERAL HINT: There are two basic ways to get sums of infinite series as in #13 and the second half of #14. One is to use Parseval's Theorem, the other is to plug a specific value of x into a Fourier series, like the one in the first half of #14. For this second approach, you have to choose the right x to make it work, and you have to justify why the convergence is valid *at that particular* x.

(14) Since f is real-valued, the imaginary part of its Fourier series must be 0, that is, $f(x) = \sum_{n=-\infty}^{\infty} c_n \cos nx$.

(15) This problem is quite long. After you prove (a), (b), (c): to show σ_N is equal to the integral shown, use (78) in the text. Then using (b) you can express $\sigma_N - f$ as an integral involving $f(x-t) - f(x)$, and you want to show this integral is small. You can do this by dealing separately with the part of the integral where $|t| \leq \delta$ and where $|t| > \delta$, for some appropriately chosen δ.

(19) This one is hard, but see what you can do! After following Rudin's hint, use Stone-Weierstass.