Math 303, Fall 2006
Assignment for November 23-27

I. Read pages 433-453 of the textbook (Riley, Hobson, & Bence, 3rd Edition)

II. Solve Problems 13.2, 13.3, 13.5, 13.7 on page 460 of the textbook and the following problems.

1. Find the Fourier transform of the following functions:

$$f(x) := \begin{cases} -1 & \text{for} \quad -\pi < x < 0 \\ 1 & \text{for} \quad 0 < x < \pi \\ 0 & \text{for} \quad |x| > \pi \end{cases}$$

$$g(x) := \begin{cases} |x| & \text{for} \quad |x| < 1 \\ 0 & \text{for} \quad |x| > 1 \end{cases}$$

$$h(x) := \begin{cases} \sin x & \text{for} \quad |x| < \frac{\pi}{2} \\ 0 & \text{for} \quad |x| > \frac{\pi}{2} \end{cases}$$

2. Find the Fourier transform of the function,

$$f(x) := \begin{cases} 2a - |x| & \text{for} \quad |x| < 2a \\ 0 & \text{for} \quad |x| > 2a, \end{cases}$$

where $a \in \mathbb{R}^+$, and use your result and Parseval's identity to evaluate

$$\int_0^\infty \frac{\sin^4(au)}{u^4}\, du.$$