Partial Differential Equations

Homework 6

due October 26, 2004

1. Evans, p. 88 problem 15
2. Evans, p. 88 problem 17
3. Find the Fourier transforms for the following functions on $\mathbb{R}$:

   (a) $f(x) = e^{-t|x|}$,

   (b) $f(x) = \begin{cases} 1 & \text{for } |x| \leq 1 \\ 0 & \text{for } |x| > 1 \end{cases}$.

4. The so-called *Helmholtz equation* on $\mathbb{R}$,

   $$u - u_{xx} = f\,,$$

   is similar to the Poisson equation: Its solution can be written in the form

   $$u(x) = \int_{\mathbb{R}} \Psi(x-y)\, f(y)\, dy\,.$$

   Use the Fourier transform and the result from (3a) to find Ψ.

Grading: 5 points per question; there is a penalty of 1 point per day on late submissions!