Homework 5

November 11, 2014

(due on Tuesday November 18, 2.10pm, before class starts):

1. The principal value of $\frac{1}{x}$ is defined as

$$P\frac{1}{x}(\phi) = \lim_{\epsilon \to 0} \int_{|x| \geq \epsilon} \frac{\phi(x)}{x} dx.$$

- Show that $P\frac{1}{x}$ defines a distribution
- Represent $P\frac{1}{x}(\phi)$ as a double integral.
- Find the primitive of $P\frac{1}{x}$ in the sense of distributions.

2. Let f be a function on $\mathbb{R}$ which is zero for $x < 0$, continuous for $x > 0$ and assume that $\int_0^1 x|f(x)|dx < \infty$. Show that f represents a distribution of order at most 1.