Math 2900 – Spring 2008
Homework IX
Due Apr 11

Problem 1: Problem 1 on page 156

Problem 2: Problem 3 on page 143

Problem 3: If $f \in L^1(0,\infty)$, define its Fourier sine transform as:

$$F(\xi) = \int_0^\infty f(x)\sin(x\xi)\,dx \qquad \forall \xi \in R$$

Show that if $\tilde{f}$ is the odd extension of *f* to *R* (i.e., $\tilde{f}(-x) = -f(x)$), then

$$F(\xi) = -\frac{(2\pi)^{1/2}}{2i}\hat{\tilde{f}}(\xi),$$

where $\hat{\tilde{f}}(\xi)$ is the Fourier transform of $\tilde{f}$.

Problem 4: Consider the function $f(x) = e^x\cos(e^x)$. Show that

(i) There is no polynomial $p(x)$ such that $|f(x)| \le p(x)$ for all *x*.

(ii) $f(x)$ defines a tempered distribution in *R*.