Math 6321 – Spring 2013   Name:

<u>HW #5</u>

Please, write clearly and justify all your steps, to get proper credit for your work.

(1) [3 Pts] Problem 45 in Ch. 13.

(2) [3 Pts] Let $f, g \in L^2(\mathbb{R})$. Prove that

$$(f * g)(t) = \mathcal{F}^{-1}(\hat{f}\hat{g})(t)$$

for all $t \in \mathbb{R}$.

(3) [3 Pts] Let $f, g \in L^2(\mathbb{R})$. Prove that

$$\widehat{f\,g}(u) = \frac{1}{2\pi}(\hat{f} * \hat{g})(u)$$

for all $u \in \mathbb{R}$.

(4) [2 Pts] Let $f, g \in L^2(\mathbb{R})$ and assume that $f * g \in L^2(\mathbb{R})$. Prove that

$$\widehat{f * g} = \hat{f}\hat{g}.$$