Homework Set 12

Math/ECE 430

due Friday, April 26, 2013

1. p. 394, # 41.2 in Gasquet & Witomski or p. 59, # 2.4 in Kaiser's *Friendly Guide to Wavelets*:
   For the signal $f(t) = e^{2\pi i \alpha t}$, where $\alpha \in \mathbb{R}$:

   (a) compute the Gabor transform (windowed Fourier transform) $\tilde{f}(\nu, b)$ for the case of a Gaussian window $w(t) = e^{-\pi t^2}$. Hint: It might be helpful to use the result $\int_{\mathbb{R}} e^{-\pi b(t+iu)^2} dt = b^{-1/2}$.

   (b) Show that the magnitude squared of the windowed Fourier transform $\tilde{f}(\nu, b)$ is maximized when $\nu = \alpha$